

# METAL FINISHING

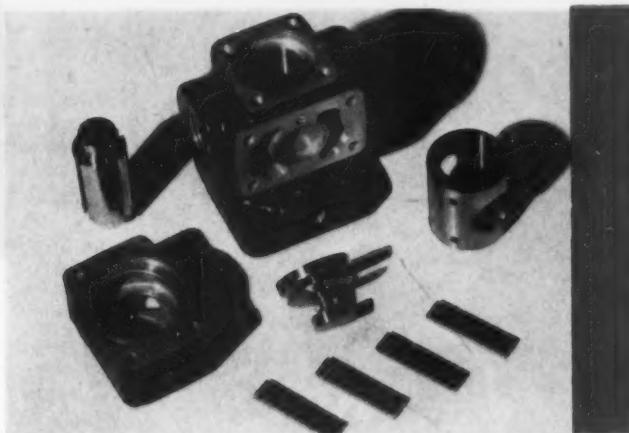
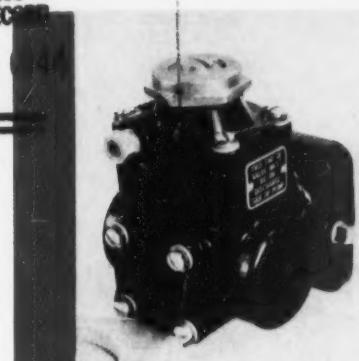
PREPARATION, ELECTROPLATING, COATING

PUBLISHED FOR THIRTY-SEVEN YEARS AS METAL INDUSTRY

BRADY  
INDEX  
RECORD

JAN

8



## LEA METHODS and MATERIALS take care of the BURRING and FINISHING Operations on these parts

Study these parts carefully. Note the variations in size and shape. Note the contours, holes, recesses and slots. To finish such parts properly and economically calls for the right technique and materials which were worked out with the help of Lea Finishing Engineers. The management reports "most satisfactory results".

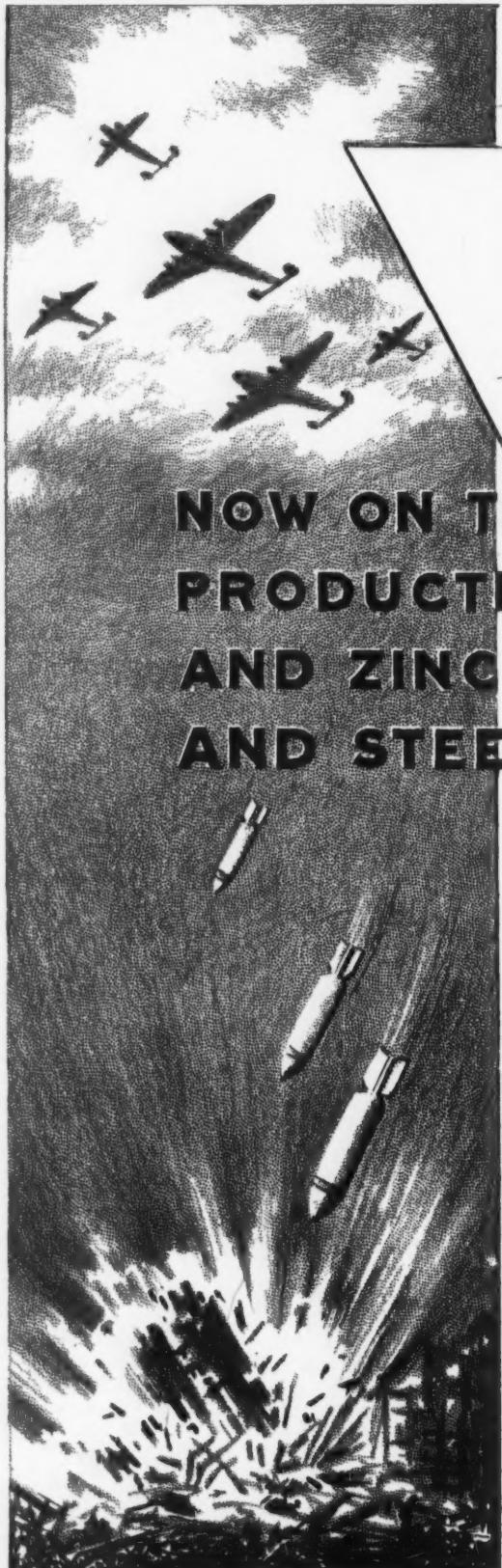
Of the thousands of different articles being finished by Lea Methods and Materials, none illustrates better the versatility and usefulness of Lea Service than do these pump parts. The burring and finishing problems were not sim-

ple but every one was effectively solved. Lea offers a two-fold service to industry which is being used advantageously by countless plants: (1) skilled engineering assistance in working out finishing methods, and (2) a great variety of greaseless and "no free grease" compositions, wheels and bobs with which to carry out the necessary steps. If you are bothered with any finishing problems or are not satisfied with results or costs, why not discuss the matter with a Lea Finishing Engineer? In writing, please outline the nature of your problem. Send sample, if possible.

**THE LEA MANUFACTURING CO.**  
WATERBURY 86, CONN.

Burring, Buffing and Polishing . . . Specialists in the Development of Production Methods and Compositions

JAN - S 1944



## NOW ON THE JOB FOR WAR PRODUCTION FOR CADMIUM AND ZINC PLATING ON IRON AND STEEL

*C*athodic Process consists essentially in using a high conductivity CLEPO Electro-cleaner, first with CATHODIC current followed by ANODIC current. This process with CLEPO materials shows marked superiority over straight anodic current cleaning. The use of this preliminary cathodic cleaning has many advantages:

First, it provides a superior method for cleaning cast iron and malleable iron which are both very sensitive to anodic action.

Second, the CATHANODIC Process provides a superior method for removal of rust and annealing scale from steel parts.

Third, for steel jobs it provides a safety factor in the cleaning operation, which is essential with unskilled personnel.

This process prepares iron and steel work 100% smut-free for cadmium and zinc plating. This smut-free condition is essential for obtaining deposits of uniform appearance and maximum salt spray resistance.

The Cathodic Process is the superior method of cleaning prior to Cadmium and Zinc plating of Airplane Parts as well as the Internal Mechanisms of our Bombs.

FREDERICK GUMM CHEMICAL COMPANY, Inc.  
538-542 Forest St., Kearny, N. J.

# Ebonol "C"

Patent Pending

## BLACKENS AND PROTECTS

is the black for copper and alloys that lasts and protects. Ebonol "C" blackened copper withstands up to 20 hours in salt spray unoiled and up to 200 hours when oiled. It is adherent and brittle --- easy to apply. Copper plated steel, when Ebonol "C" treated, affords much greater protection to the base steel especially when oiled.

Ebonol "C" is the ideal process for blackening copper, brass and bronze. It is widely used and war proved.

AFTER 200 HOUR SALT SPRAY TEST

Ebonol treated copper plate

Untreated copper plate

The above steel panel was copper plated 0.0002" thick. Half was Ebonol "C" treated and the whole panel was oiled. The unblackened section rusted at 16 hours and was badly rusted after 200 hours in salt spray. The Ebonol "C" treated half was almost perfect after 200 hours.

### OTHER EBONOL BLACKENING PROCESSES

Ebonol "A" for Aluminum

Ebonol "S" for Steel and Iron

Ebonol "Z" for Zinc and Zinc Alloys

# THE ENTHONE COMPANY

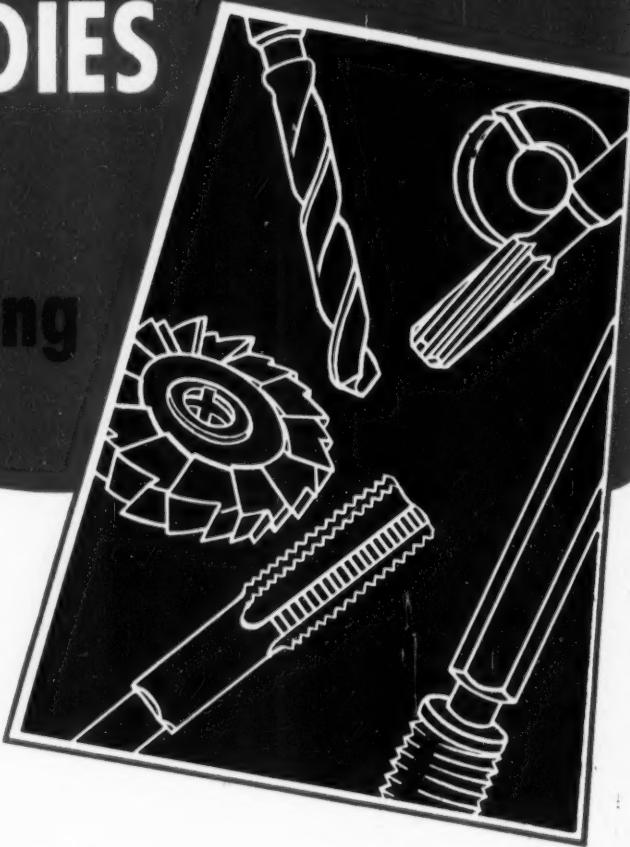
## NEW HAVEN, CONNECTICUT

REPRESENTATIVES IN PRINCIPAL CITIES

# *Faster, more effective Degreasing of TOOLS and DIES before hard chrome plating*

**Essential chemically  
clean surfaces assured  
by NEW Oakite technique**

Tools, dies and gauges are critical implements in the battle of production. Hard chrome plating of surfaces conserves them ... extends their useful life. For the essential CHEMICALLY clean steel surfaces required before plating, use that outstanding wartime material known as ...



## **OAKITE COMPOSITION No. 90**

The effective wetting-out, emulsifying and penetrating properties of this quick-acting ANODIC degreasing material SPEEDILY, completely remove insoluble smut, grease, shop dirt and other accumulations. Resulting CHEMICALLY CLEAN surfaces assure uniform, more durable deposit of hard chromium plate! Your nearby Oakite Technical Service Representative will gladly give you full details on this important production operation, or write us direct.

### **STRIPPING OLD CHROMIUM DEPOSITS**

Where tools, gauges and dies are to be re-plated, successful Oakite techniques are available for quickly stripping chromium deposits from surfaces. Take advantage of FREE Oakite Wartime Service and experience on this or any other trouble-causing production cleaning problem.

Manufactured only by  
**OAKITE PRODUCTS, INC., 18 Thames Street, NEW YORK 6, N.Y.**  
Technical Service Representatives in All Principal Cities of the United States and Canada

**OAKITE**  
MATERIALS...METHODS...SERVICE



**CLEANING**  
FOR EVERY CLEANING REQUIREMENT

To the  
Metal Finishing Industry

Season's 1944 Greetings

... With deep appreciation of the  
co-operation of our business friends  
and associates ... we extend to one  
and all — our sincere wishes for a

Happy and Victorious  
New Year

FREDERIC B. STEVENS INCORPORATED  
DETROIT 26 MICHIGAN



• NEW ENGLAND . . . . . 166-182 Brewery St., New Haven, Conn.  
• NEW YORK and PENNSYLVANIA . . . . . 93 Stone St., Buffalo, N. Y.  
• INDIANA . . . . . Hoosier Supply Co., 36 S. Cruse St., Indianapolis, Ind.

• CANADA . . . . . FREDERIC B. STEVENS OF CANADA, LIMITED  
• 1262 McDougall St. . . . . Windsor, Ontario  
• 2368 Dundas St. West . . . . . Toronto, Ontario





*Decide in favor of*

**HARSHAW**

**ANODES  
CHEMICALS**

• BACKED BY "ACCUMULATIVE PLATING EXPERIENCE"



*This Lead Plating booklet furnishes you with practical plating information which you can use. We will gladly send you this free book. Write for it . . . now.*

**G**OOD plating evidence is on the side of Harshaw Anodes and Chemicals. The testimony represents all phases of plating and is strongly backed by "Accumulative Plating Experience". The decision was wisely made in favor of Harshaw Anodes and Chemicals.

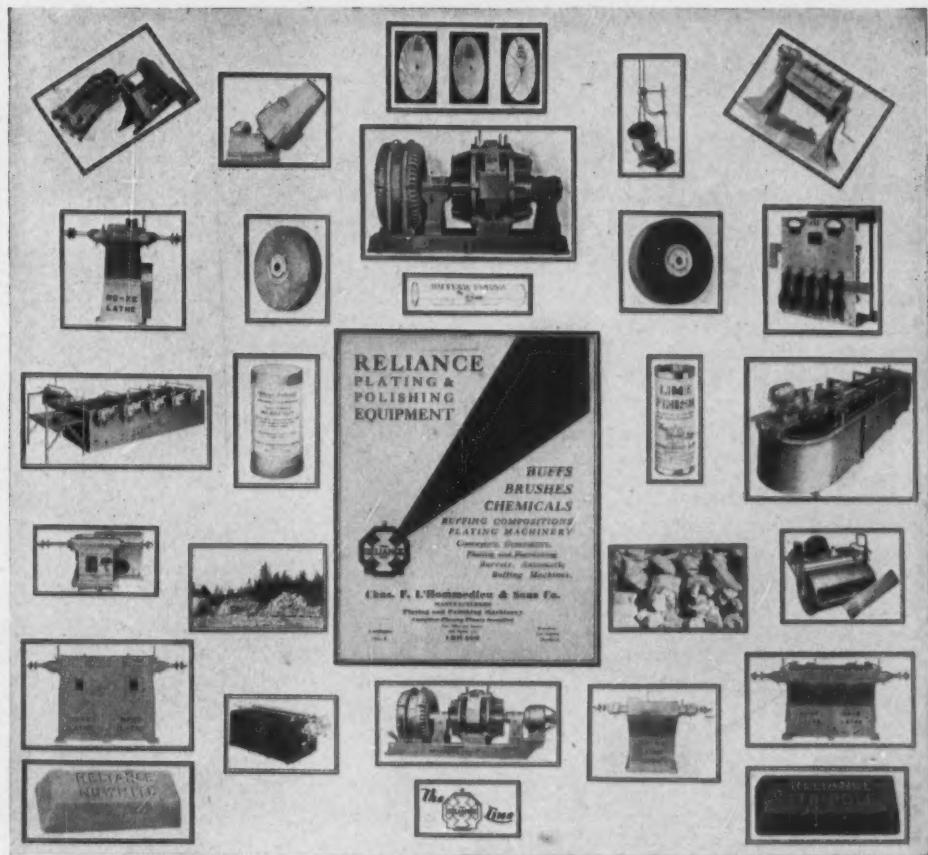
Plating research . . . developing new techniques . . . is a fundamental policy of Harshaw's plans to retain top recognition in the plating industry. This interest and determination is as strong today as it was more than fifty years ago.

You need not be hesitant in deciding in favor of Harshaw Anodes and Chemicals. Their performance reflects more than fifty years of experience . . . in the plant . . . and in the laboratory . . . and their selection supports your good judgment.

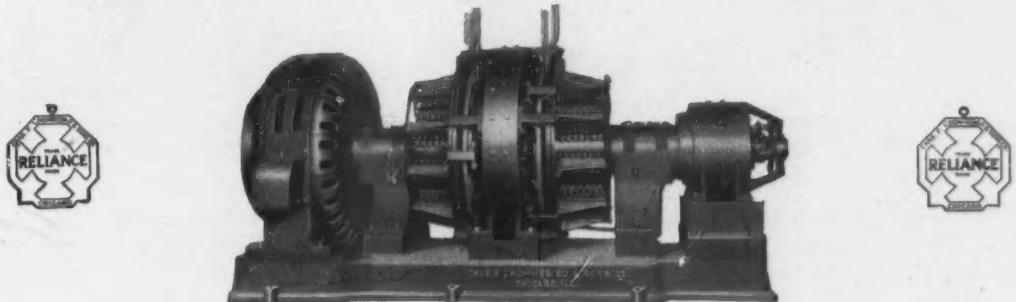


**THE HARSHAW CHEMICAL CO.**  
1945 East 97th Street, Cleveland 6, Ohio  
BRANCHES IN PRINCIPAL CITIES

# QUALITY PRODUCTS



## EVERYTHING FOR PLATING AND POLISHING



### ANODIZING GENERATORS

## Chas. F. L'Hommedieu & Sons Co.

*Manufacturers of*  
**PLATING AND POLISHING MACHINERY**  
 Complete Plating Plants Installed

W. R. Shields  
Detroit, Mich.

C. B. Little  
Newark, N. J.

O. M. Shoe  
Philadelphia, Pa.

General Office and Factory: 4521 Ogden Avenue

**CHICAGO**

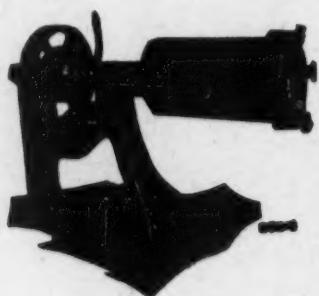
Branches:  
Cleveland and Los Angeles

EVERYTHING IN EQUIPMENT AND SUPPLIES FOR PLATING AND POLISHING

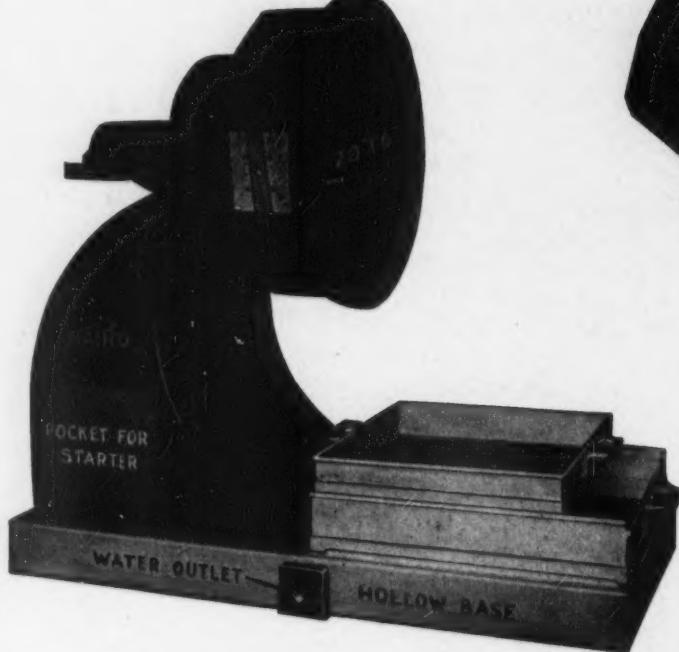
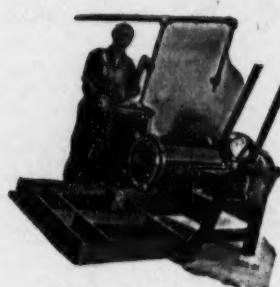
METAL FINISHING, December, 1943



**HORIZONTAL BARRELS**



**TILTING BALL BURNISHING BARRELS**



This shows a High and Narrow Type of Barrel mounted on "Baird" Model D. or Pedestal Type Motor driven Oblique Tilting Tumbler.

As shown the barrel was lined for use for burnishing with hardened steel balls.

These barrels may be of any suitable material depending on the job. Cast iron or fabricated steel unlined or lined with rubber etc. for rolling in abrasives.

Made in 20" dia. x 6" for No. 1 Tumbler

Made in 24" dia. x 8" for No. 2 Tumbler



This shows the side of a No. 1 BAIRD Model D. Single Oblique Tilting Tumbler with a No. 22 Sheet Steel Polygonal Barrel and with an Automatic Electrical Tilting Device.

This device AFFORDS GREATEST SAFETY — LEAST LABOR — LEAST FLOOR SPACE—LEAST AMOUNT OF DISTANCE TO MOVE WORK in USING the tumbling barrels. SAVES TIME AND FLOOR SPACE.

When tumbling questions come up "ASK BAIRD ABOUT IT"



**THE BAIRD MACHINE COMPANY**  
STRATFORD 9, CONNECTICUT

Since 1846 specializing in high production machinery for articles of wire and for ribbon metal. Also machines to turn, bore, etc., castings, forgings, etc., up to 10½" diameter.

# OH! GENERAL CHEMICAL OFFERS A 50% SOLUTION OF LEAD FLUOBORATE ... and at a new low price!

The widespread acceptance by platers of General Chemical Lead Fluoborate has made possible the offering of a *50% solution*, and *at a new low price*... a price that will make a real difference in your lead plating costs!

Platers find this solution saves time and labor because of these extra advantages: dilutes simply with water—high concentrated strength—requires no filtering, sediment-free—a standardized composition—uniform and unvarying.

## REPLACES SCARCE PLATING METALS!

General Chemical Lead Fluoborate makes a superior plating bath and its use conserves many war-scarce metals. The special chemical and physical properties of the lead plate provide useful characteristics not obtainable with other plating metals... for example, it plates directly on steel and cast iron.

Today, Lead Fluoborate fills a vital war need in metal plating—and may offer a solution to *your* plating prob-

lem! Write for prices and information on Lead Fluoborate Solution. Use the coupon below.

**AIRPLANES DEPEND ON LEAD PLATED ENGINE BEARINGS!**  
Motor and bearing manufacturers find lead fluoborate saves time and releases scarce labor for other vital jobs.



**OTHER SUCCESSFUL APPLICATIONS!** To prevent corrosion by moisture, acid, salt-spray, etc., manufacturers are using General Chemical Lead Fluoborate Solution to plate battery parts, gears, nuts and bolts, and various other metal parts.

GENERAL CHEMICAL COMPANY • 40 Rector St., New York 6, N. Y.

Gentlemen: Please send me without obligation prices and information on Lead Fluoborate Solution.

Name \_\_\_\_\_  
Position \_\_\_\_\_ Company \_\_\_\_\_  
Address \_\_\_\_\_  
City \_\_\_\_\_ State \_\_\_\_\_

### OTHER FLUOBORATE COMPOUNDS

Acid Fluoboric      Indium Fluoborate  
Cadmium Fluoborate      Nickel Fluoborate  
Chromium Fluoborate      Silver Fluoborate  
Ferrous Fluoborate      Stannous Fluoborate  
Zinc Fluoborate



**FIRST IN FLUORIDES**

**GENERAL CHEMICAL COMPANY**  
40 RECTOR STREET, NEW YORK 6, N. Y.

Technical Service Offices: Atlanta • Baltimore • Boston • Bridgeport (Conn.) • Buffalo  
Charlotte (N. C.) • Chicago • Cleveland • Denver • Detroit • Houston • Kansas City  
Milwaukee • Minneapolis • New York • Philadelphia • Pittsburgh • Providence (R. I.)  
St. Louis • Utica (N. Y.)

Pacific Coast Technical Service Offices: San Francisco • Los Angeles  
Pacific Northwest Technical Service Offices: Wenatchee (Wash.) • Yakima (Wash.)  
In Canada: The Nichols Chemical Company, Limited • Montreal • Toronto • Vancouver

# Brushes Wearing Too Fast?



## Inspect for these CAUSES

Most of the reasons for excessive brush wear are listed alongside. Look for these conditions and correct them.

### Check Brush Rigging to Prevent Breakdowns

It's wise to examine brush holders, shunts and brushes once a month. Holders should be replaced when the inside broached section is worn. Keep the shunts tight and free from corrosion. If the brushes themselves are giving you trouble, or you want to better their performance, write SPEER. We'll help you put the finger on what's wrong, tell you what brush grade is best for specific machines. This counsel is our boost to better commutation and its help in stepping up effective use of wartime power. Just ask for a SPEER Brush Data Form for every plating motor or generator you would like to improve. Fill in and return the forms for scientific recommendations based on forty-five years of commutation experience. Kindly write on your business stationery for any number of forms.

BACK THE ATTACK — BUY MORE WAR BONDS

1. Brushes too soft
2. Rough commutator
3. Abrasive dust in ventilating air
4. Off neutral setting
5. Bad commutation
6. High, low or loose bar
7. Excessive brush tension
8. Threading and grooving
9. Oil or grease from air or bearing
10. Motor kept on line when not used

**SPEER**  
CARBON COMPANY



ST. MARYS, PA.  
CHICAGO · CLEVELAND · DETROIT  
MILWAUKEE · NEW YORK · PITTSBURGH



# POST-WAR DESIGN

FAVORS

BLACK

by PENTRATE

*The acknowledged BLACK finish for steel*

Severe battle conditions have proven the worth of the durable penetrating qualities of phytanium-blended Pentrate. Post-war designers are giving Pentrate a prominent place in their plans. Send for free Pentrate booklet.

HEATBATH CORPORATION SPRINGFIELD 1,  
MASSACHUSETTS





## This FUME CONVEYOR INSTALLS IN THE DUCT



**YOU CAN INSTALL** DeBothezat Bifurcators in any position from horizontal to vertical . . . and right in the duct! This feature eliminates elbows, bends and supporting platforms. Bifurcators are supported like any length of ordinary duct work. Extreme flexibility makes installation simple and inexpensive.

**MOTOR ISOLATED FROM FUMES** in a through-ventilated chamber. Motor is easily accessible for inspection and servicing.

**MOTOR PROTECTED** against burning out by non-overloading power characteristic of the DeBothezat Axial-Flow fan.

**SIZES** of Bifurcators range from 18" to 48" in a wide range of capacities.



Send for Interesting  
FREE Bifurcator Book



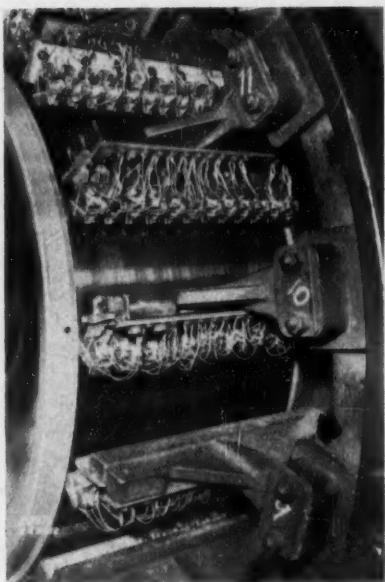
**De Bothezat**

VENTILATING EQUIPMENT

Division of

AMERICAN MACHINE AND METALS, INC., EAST MOLINE, ILLINOIS

*Improve*  
**OPERATING CONDITIONS  
ON YOUR  
GENERATOR**



WITH  
*Keystone*  
**Metal-Graphite Brushes**

• Keystone Metal-Graphite Brushes for low voltage generators and slip-ring applications are specially designed to improve the operating conditions of these units to produce maximum efficiency. Exclusive features of Keystone brush construction and manufacture mean:

- HIGH CONDUCTIVITY
- LOW COEFFICIENT OF FRICTION
- GOOD COMMUTATION
- LONG BRUSH LIFE
- LOW MAINTENANCE COSTS

Standard types and sizes are available for prompt shipment. Send us machine data and grade desired, or request brush recommendations from Keystone's research and engineering laboratories. Your inquiry will receive prompt attention.

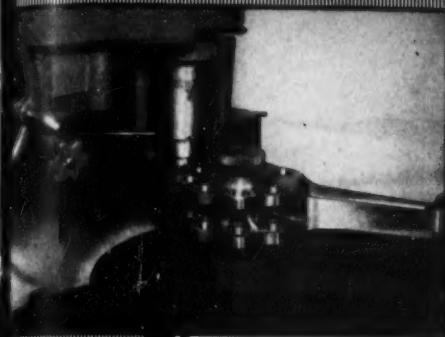
**KEYSTONE CARBON CO., INC.**

Manufacturers of Precision Molded Products

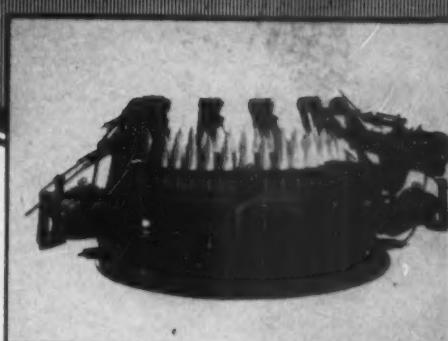
1935 STATE ST., SAINT MARYS, PENNA.

METAL FINISHING, December, 1943

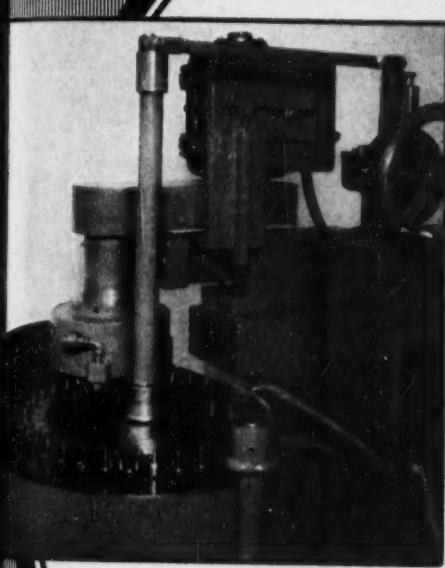
# Solving the Man-Power Shortage in POLISHING..BUFFING.. WIRE BRUSHING..BURRING



Special Acme Machine  
for polishing engine  
parts.

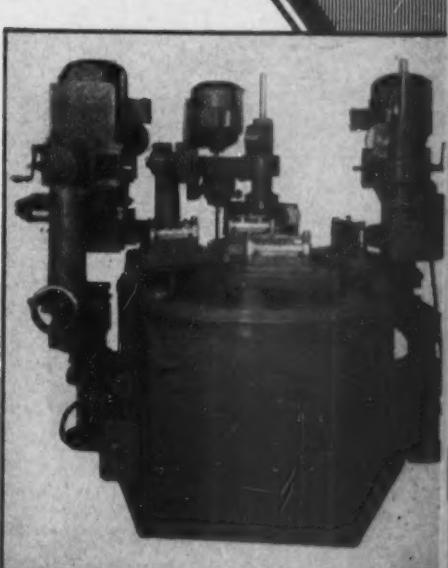


Special Acme Machine  
with 8 belt heads—for  
polishing tapered cylindrical  
parts. Multiplies daily  
production, with greatly  
reduced man-power.



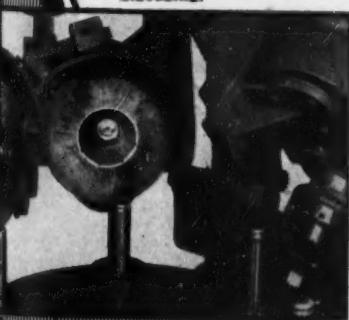
Special Acme Machine for grinding  
small mechanical parts—2000 per  
hour. Automatic wheel feed. Auto-  
matic diamond dresser. Automatic  
unloading.

Keep  
Production Up  
BY USING  
**ACME**  
**AUTOMATICS**  
And Spreading  
Your Man-Power!



Special Acme Machine for blending the radius  
in washers—1200 to 1500 operations per hour.

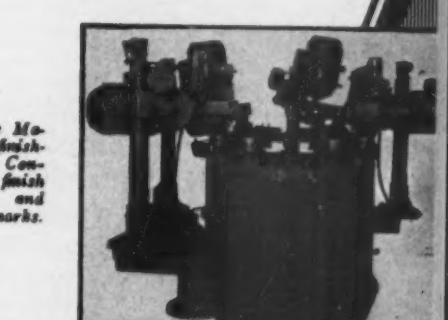
Special Acme Machine for polish-  
ing and oiling aircraft parts.



Acme Rotary Ma-  
chine for polish-  
ing, buffing and  
wire-brushing. Big  
savings in man  
hours.



Special Acme Ma-  
chine for finish-  
ing platons. Con-  
structed to finish  
value reverse and  
avoid slug marks.



**ACME Manufacturing Co.**  
1642 HOWARD ST. • DETROIT, MICH.  
*Builders* OF AUTOMATIC POLISHING AND BUFFING MACHINES FOR OVER 25 YEARS



**It's not too  
early to think of  
peace time product  
finishing**

**T**HE post-war plans of many manufacturers have been carried to the point of specifying the metals and finishes for new products.

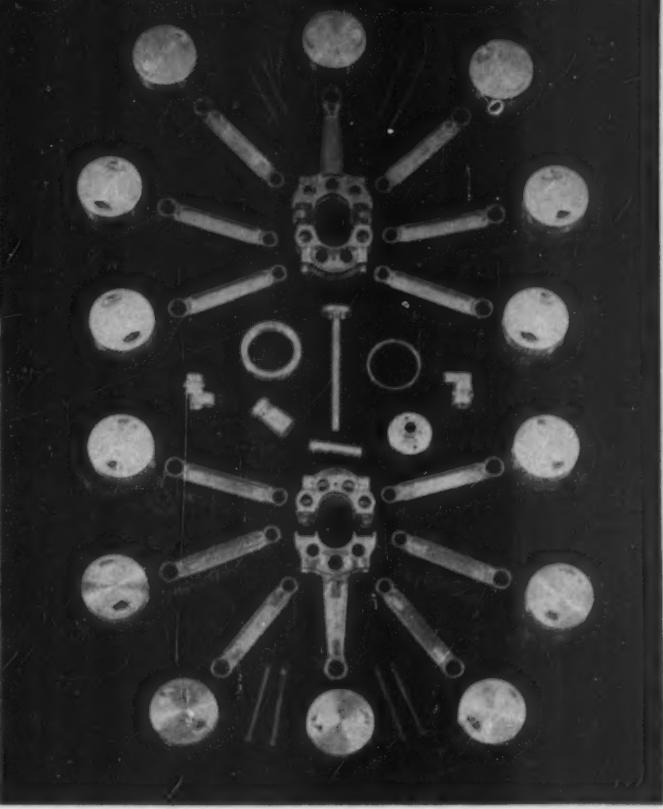
We have already talked with manufacturers, who profiting by their successful use of Du-Lite on war production are planning to use this tough, rust-resistant finish on their peace-time products.

They have found from actual experience that Du-Lite processing is simple and low in cost. Their use of Du-Lite on war production has demonstrated the merits of this finish and its adaptability to the peace-time products they are now planning.

The Du-Lite Engineer, located in your industrial area, is prepared to discuss with you the use of Du-Lite for finishing steel products that you may be planning for future production. At the same time he can help you with your present needs in black finishing for war production. He's a specialist, and a good man for you to know. Wire or write Du-Lite and he will be glad to call on you.

**DU-LITE CHEMICAL CORP.  
MIDDLETOWN, CONNECTICUT**

# IT'S A FIGHT TO THE FINISH!



WHEN a Hellcat pilot eases up on the bridle of the 2000 horsepower packed into his Pratt-Whitney engine and goes tearing away to administer a dose of sudden death to some little stinking son of a Sinking Sun, a small matter like the coefficient of friction between operating parts of that engine becomes enormously important.

Not many months ago this coefficient of friction, between parts whose tolerances had to be held to within thousandths of an inch, was a limiting factor in the maximum performance of our most advanced high-output aircraft engines. It wasn't that modern finishing methods and materials couldn't produce the mirror-like finishes required—on the contrary the finishes obtained were so perfect that they had no affinity for the engine lubricant—in short, those mirror surfaces shed engine oil like water rolls off a duck's back. The inevitable result was excessive friction heat—a condition that spelled TROUBLE in capital letters.

Licking this problem was no cinch—mirror-like finishes had to be maintained but certain

profilometer requirements also had to be met. This meant developing a buffing composition that not only polished but also engrained the metal surfaces with millions of microscopic channels which would retain enough lubricating oil under every operating condition, to provide a protective oil film on every vital part. A McAleer *tailored-to-the-job* greaseless type composition was the answer—a composition of such dependable uniformity and exceptionally controlled abrasive diffusion, that it met every prescribed Micron finish requirement demanded by Aircraft Specifications.

This need for perfection is nothing new to McAleer. We are well aware that this is a fight to the finish . . . even to the "finish" of a vital aircraft engine part. Because *quality-controlled* finishing materials are the products—not the sideline of McAleer, this company is qualified by years of practical experience and unusual abilities to aid you in solving your most vital finishing problems. Whether they involve metals, plastics, or both, let us *start at the finish*.



Manufacturers of Quality  
Controlled Finishing Materials

ROCHESTER, MICHIGAN

## *In Appreciation—*

THE fall of 1943 completes our 20th year in the manufacture of PERMAG Cleaning Compounds which have been used very successfully, for industrial purposes.

It has always been the aim of the founder and president, Mr. Edward Magnuson, of the Magnuson Products Corporation, and those who have been associated with him, through the years, to produce cleaning compounds of highest efficiency and unquestioned dependability for the type of work encountered during this period.

The generous response from our customers, shown in the constantly increasing volume of sales, season after season has not only been extremely gratifying but has been an incentive to greater efforts in developing special cleaners and compounds for specific requirements, and especially for those which have arisen during the war period.

*We wish at this time to express our gratitude for the loyalty and confidence our customers have always shown, and also for the agreeable business relationship that has existed from the beginning of our establishment.*

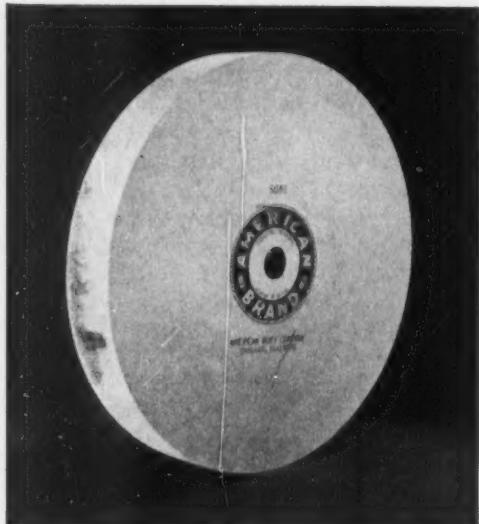
*Main Office:*  
50 COURT ST.  
BROOKLYN, N. Y.  
*Factory:* Brooklyn, N. Y.

MAGNUSON PRODUCTS CORPORATION

PERMAG Cleaning Compounds

*In Canada: Canadian PERMAG Products, Ltd., Montreal and Toronto*

Nationally  
Represented  
Warehouses in  
Principal Cities



## **The No. 1 FELT POLISHING WHEELS "AMERICAN BRAND"**

American Brand Felt Polishing wheels are made of high grade pure wool. No loading or weighing of any character is used. The material is uniform in texture throughout the wheel. Hardness is acquired by shrinkage of wool only—the greater the shrinkage the harder the wheel. Made in any diameter, also in face widths from  $\frac{1}{2}$ " to 6". For wider face widths, submit specifications. "American" felt wheels are made in nine degrees of hardness. Write, wire or phone for further information.



**AMERICAN BUFF COMPANY**  
Factory & General Offices  
711 WEST LAKE STREET, CHICAGO 6, ILLINOIS  
Sales Offices in Principal Cities

Promat is fully equipped in their new quarters in Waukegan, Ill., to meet the increasing demand for Promat products.



## A REVOLUTIONARY

### Process of Electro-plating!

Promat is a radically different and complete method of electro-deposition of metals—setting up new high standards of quality and production at lower operating costs.

Promat replaces conventional plating methods by converting your present electrolytes to Promat electrolytes at little expense. New Promat chemicals and solutions make possible the advantageous use of super-imposed alternating current. The Promat Power Unit or the Promat Kicker supply this current. Concentrates and frequent laboratory analyses guarantee constant peak efficiency.

Three individual Promat processes in zinc, and two in cadmium are now available to you.

All Promat processes have the same characteristics—extremely fine grained deposits, wide operating ranges, uniform color and efficiency.

Promat meets exacting war plating requirements and specifications, and is successfully plating steel, cast and malleable iron, etc. War products:—shell cases, parts, plasma containers, hardware and thousands of items are daily being finished at astonishing speed with uniform quality as only Promat can provide.

We gladly offer suggestions and information regarding your plating problems. Send samples of your product for Promat processing in our laboratories for your inspection and tests.

You will benefit by knowing more about Promat. Individual processes are fully described in a new illustrated booklet just off the press. Yours for the asking.

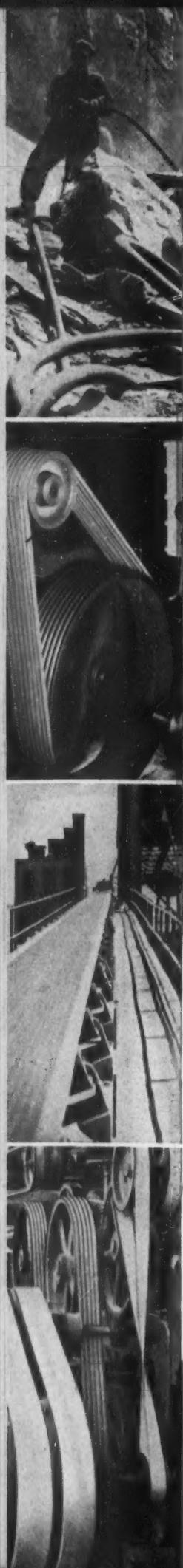


## The PROMAT DIVISION, Poor & Company

851 S. Market Street  
Waukegan, Illinois

METAL FINISHING, December, 1943

EASTERN OFFICE C.F.R. SALES CO.  
538 FOREST ST., KEARNY, N. J.



# MANHATTAN

## FLEXLASTICS

**Condor**  
PRODUCTS

Conveyor and  
Elevator Belt  
Compensated Belt  
Transmission Belt  
V-Belt  
Air Hose  
Contractors Hose

Fire Hose  
Hydraulic Hose  
Oil and Gasoline  
Hose  
Sand Blast Hose  
Steam Hose  
Suction Hose

Water Hose  
Chute Lining  
Launder Lining  
Industrial Brake  
Blocks and Lining  
Molded Rubber  
Goods

Rubber Lined Tanks  
Rubber Covered  
Rolls

—

Abrasive Wheels  
Bowling Balls

THROW YOUR SCRAP  
INTO THE SCRAP!

KEEP AHEAD WITH



# FLEXLASTICS

## WHAT THEY MEAN TO YOU IN INDUSTRIAL RUBBER

**SERVICE . . .** Here is a name full of meaning—a vital, manifold meaning, the importance of which is stressed and highlighted by war and scarcity.

MANHATTAN FLEXLASTICS\* are of over 1,000 kinds—each accurately compounded of one or more forms of "manufactured" and natural rubber with different ingredients in correct proportions and then given its ultimate qualities by closely controlled processing.

Rubber compounding is an art, seasoned with scientific research, development and controls. To formulae must be added the skill and experience of the processor. "Rubber goods made only of rubber would be as useless as a cake made of nothing but flour."

It is from long practice of this art that the three essential qualities have been built into MANHATTAN mechanical rubber goods. These essential and inclusive qualities are *flexibility, elasticity and lasting service*. Together,

they are embodied in FLEXLASTICS\*—a term which aptly and fittingly describes the various types of "rubber" which are used in making such MANHATTAN products as flat power transmission belts; V-belts; conveyor belts; steam, water and air hose; fire hose; oil-well drilling hose; rubber covered rolls; rubber linings for processing tanks, piping and equipment; and a myriad specialties used on aircraft, ships, war and production equipment.

The long list of achievements like Condor Compensated Belt, Homo-Flex Hose, Homocord Belt, the Extensible Tip for endless belts, Radio-Active Treated Fire Hose and many others illustrate how well MANHATTAN has applied the art of rubber making. Some of these developments, available to industry only after Victory, will be important factors in the shifting tide of production.

It will always be sound policy to keep ahead with MANHATTAN.

50 YEARS

OF RESEARCH

1893

1943

Only the name is new. Back of FLEXLASTICS\* is a half century of engineering and chemical research and experience which combine the skilled application of FLEXLASTICS with properly located strength members for long-lasting service from natural, reclaimed and "manufactured" rubbers.

Compounding of the several types of "manufactured" and natural rubbers with other ingredients and processing them to obtain the required chemical and physical qualities is another important contribution by MANHATTAN to the comprehensive advantage you will obtain from FLEXLASTICS.\*

\*The term FLEXLASTICS is a Manhattan Trade Mark. Only MANHATTAN can make FLEXLASTICS.

THE MANHATTAN RUBBER MANUFACTURING DIVISION  
of RAYBESTOS-MANHATTAN, INC.  
EXECUTIVE OFFICES

PASSAIC, NEW JERSEY

# LASALCO Offers You

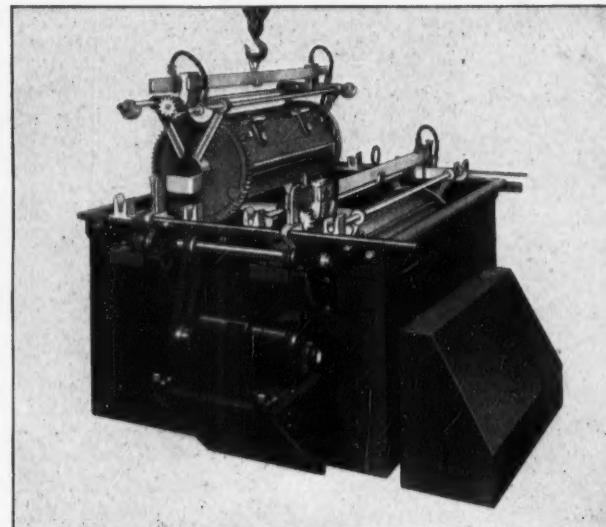
**a Complete Line  
of Cleaning, Plating,  
and Rinsing Machines  
That Help Save  
Precious Time.**

**S**avings in time mean a saving of manpower—and both mean saving lives today—as well as saving production costs. So, you owe it to yourself, your friends in the armed services, and your country to get the most production from the least manpower. Why not call a Lasalco engineer when you want to step up plating and finishing room output?

Let him give you the latest information on zinc plating and Cronak Treating. He can assist you with finishing room problems on many war production jobs, such as steel shell cases. His wide experience will help you with burring, tumbling, sanding, and practically any other related problem. Ask him to come in; his help will prove valuable to you.

# **LASALCO, INC.**

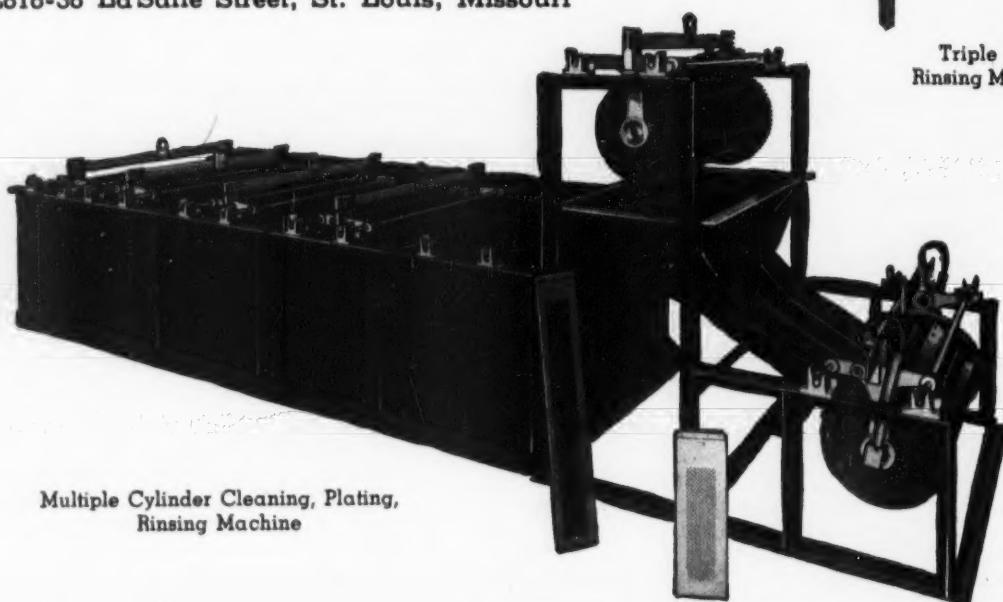
2818-38 La Salle Street, St. Louis, Missouri



### Twin Unit Barrel Plater



## Triple Unit Rinsing Machine



### Multiple Cylinder Cleaning, Plating, Rinsing Machine

# WYANDOTTE R2\*

## It's NEW

—A product developed to prevent the rusting of ferrous metals for periods of from 5 to 10 days.

This product is ideal for preventing rust between production operations.

Wyandotte R2 is in powdered form and practically neutral.

One example of its many uses: steel cartridge case manufacturers cleaning cases in two compartment power washers use Wyandotte R2, at  $\frac{1}{2}$  ounce per gallon of water, in the second compartment rinsing operation, 140°F., with no drying operation.

Wyandotte R2 prevents rust prior to lacquering.

There is a specialized Wyandotte Metal Cleaning and Degreasing Product for every war production metal cleaning job. Located near you is a Wyandotte Field Engineer with a wealth of technical experience and information. His services are at your call.

\* Patents applied for.



**Wyandotte**

SERVICE REPRESENTATIVES IN 88 CITIES

WYANDOTTE CHEMICALS CORPORATION  
J. B. FORD DIVISION • WYANDOTTE, MICHIGAN

• Wyandotte Chemicals Corporation consolidates the resources and facilities of Michigan Alkali Company and The J. B. Ford Company to better serve the nation's war and post-war needs.

# DO THE WHOLE JOB



*-and do it* **RIGHT!**

Don't stop halfway with the cleaning job. Careful cleaning of the metal for electroplating is only the beginning. The plating solution must be clean, too—otherwise impurities in the bath get on the plating surface and the job suffers.

The simple way to keep the solution clean is through the *continuous* removal of impurities assured by the regular use of DARCO S-51.

DARCO S-51, an activated carbon, *adsorbs* soap, grease, oil, colloid molecules, decomposition products and even "invisible" impurities. When the DARCO is filtered out, all those impurities go with it.

Specify DARCO S-51. A dime's worth keeps 100 gallons of solution clean for a week. Buy from your dealer—or write for a sample.

*The article "Physical Removal of Impurities from the Plating Solution" discusses continuous removal of impurities in detail. Write for a copy.*

DARCO—Reg. U. S. Pat. Off.



This trade-mark identifies the genuine. Accept no packages without it.

**DARCO**  
CORPORATION  
60 East 42nd Street, New York 17, N.Y.





# let's get on with the war

## ... AND SPEED THE AMMUNITION



with

### **PENN SALT CLEANERS!**

Reg. U. S. Pat. Off.

Let's keep hitting the Axis with everything we've got! If you have a metal cleaning operation, let us show you what a Pennsalt Cleaner can accomplish in getting it done in less time—or at less cost—or with more output.

Take this case for example: A well-known steel company was producing 0.30, 0.50 and 0.55 calibre cups for bullet jackets. Involved was a continuous washing, annealing, quenching, pickling and rinsing process. The components were carried through a perforated shell partly submerged in the cleaning solution.

When the Pennsalt serviceman called, he found that the cleaner then in use was only partly effective. Unsaponified oil was burning off in the annealing furnace, creating smoke and soot—and because the perforations in the shell became clogged, there were repeated delays due to cleaning difficulties.

When a fresh solution of Pennsalt Cleaner was used in the tank at one ounce per gallon concentration—*delays and cleaning difficulties stopped at once!*

Let our experienced technicians help you with *your* metal cleaning problems. Actually billions of cartridge cases, shell cases and bullet jackets—as well as great quantities of other ordnance and armament—have been most successfully cleaned with Pennsalt Cleaners.

Consultation involves no obligation. Write fully—Dent, MF



**PENNSYLVANIA SALT**  
MANUFACTURING COMPANY  
*Chemicals*

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BURRING • GREASELESS  
HARDENED STEEL COMPOSITION

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*Samples Shipped Promptly*

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**YOUR METAL-WORKERS**

CAN KEEP SKIN FREE FROM  
IRRITATION  
WITH  
**M·S·A**  
**F E N D**  
INDUSTRIAL CREAMS  
AND LOTIONS

Protect your workers against skin irritation, rash and soreness with FEND. Six different FEND Creams and Lotions provide *safe, positive, proved protection* against many-score skin afflictions. Easy to apply and remove.

Write for descriptive Bulletin FA-79.

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Braddock, Thomas and Meade Streets  
Pittsburgh, Pa.

# Koroseal<sup>\*</sup> TANK LININGS

\* Trade Mark of the B. F. Goodrich Co.

## BY UDYLITE

Here is a tank lining that has everything. Koroseal is a synthetic elastic material which is unusually resistant to oxidizing acids and corrosives.

Koroseal is quickly and easily applied directly to wood, steel or other surfaces by means of specially developed adhesives. No vulcanizing. Approximately 100 lbs. per square inch bonding strength.

This material allows practically no absorption of chemical solutions and it does not contaminate plating bath.

Koroseal is unaffected by oils or grease. Resists abrasion well and it is easily and quickly repaired.

● Write for our new detailed bulletin on this better tank lining ●

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## **Authority on the Subject of INDIUM**

- 1 . . . by virtue of years of research into the sources, extraction and purification of this important alloying element for the non-ferrous metals.**
- 2 . . . by virtue of the extensive studies of its properties and usefulness.**
- 3 . . . by virtue of active technical cooperation with many manufacturing firms utilizing one or more of its properties to greatly improve their own products.**

If you are manufacturing products from non-ferrous metals, it is probable that the addition of INDIUM would be helpful. Our research department — authority on the technical phases of INDIUM — will be glad to cooperate.



### *Outline of Properties Imparted by INDIUM to Non-Ferrous Metals:*

- Great increase in their tensile strength and fatigue resistance.
- Great increase in their hardness and wear-resistance.
- Great increase in their corrosion resistance.



# *The INDIUM Corporation of America*

UTICA, N. Y.

New York Office: 60 East 42nd Street

14-16-6

# Quick Recovery of Copper



## New Du Pont method saves almost 100% usable metal

THE COPPER PLATE used as a stop-off in localized hardening and for other purposes can be recovered. A new method of deplating, recently developed by Du Pont, permits recovery of practically 100% usable metal.

The deplated metal is recovered in a form satisfactory for direct reuse as anode material. Deplating can be carried out rapidly in conventional equipment. Up to 0.001" of copper can be

removed in 9 to 10 minutes, using current densities up to 60 A/SF. In decided contrast to usual stripping methods, deplating takes place without attack of the base metal.

This process is generally available to manufacturers engaged in production of essential war materials. Further information can be obtained from Du Pont Technical Service. And remember, when you call Du Pont, you're calling on a

group of highly specialized technical men ready to help you with knowledge gained from many years' plating experience. They will help you choose the process and materials best suited to different requirements. Write, wire or telephone E. I. du Pont de Nemours & Co. (Inc.), Electroplating Division, Wilmington, Del.

**CONSERVE FOR VICTORY—  
USE PLATING MATERIALS WISELY!**



## DU PONT ELECTROPLATING

**Chemicals • Processes • Service**

**BETTER THINGS FOR BETTER LIVING . . . THROUGH CHEMISTRY**

## AFTER THE WAR WHAT?

All plating departments will be running full tilt, finishing products of all kinds to fill the shelves of the country with merchandise.

### ALSOP "SEALED DISC" FILTERS WILL BE AN IMPORTANT PART

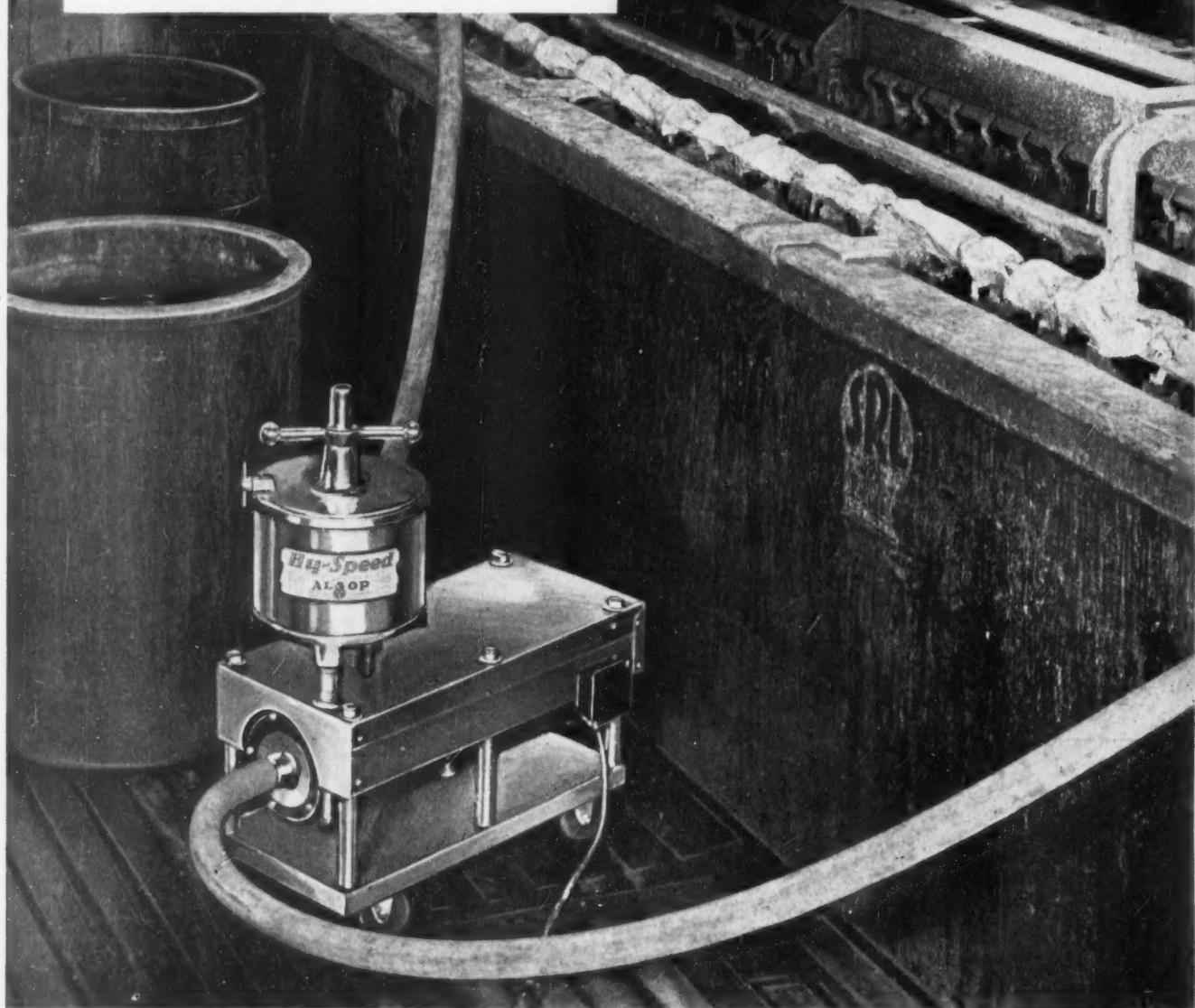
of plating rooms everywhere because by filtering plating solutions and completely removing all dirt, sludge and impurities, finer finished surfaces with fewer rejects, and increased production will be the result.

A fine way to meet competition.

Ask us how our filters can  
improve your products.

ALSOP ENGINEERING CORP.  
32 BRIGHT ST., MILLDALE, CONN.

# Alsop Sealed Disc FILTERS



# CHECK!

## UNICHROME "AIR DRY" RACK COATING

— a tough, easy-to-use rack insulation that saves frequent re-coating — withstands hot alkaline cleaners, acid dips, hard chromium solutions and chromic or sulphuric anodizing baths.

## UNICHROME COATING 202

A coating material especially suitable for insulating racks used in anodizing solutions and cyanide solutions. Applied in hot, strongly alkaline, cyanide solutions. Applied by dipping and normally force-dried to obtain the good adherence required for this severe service.

## UNICHROME "QUICK DRY" STOP-OFF 322

— a fast-drying, resistant lacquer that is easily applied and cuts cleanly at the edges — specially compounded for cyanide copper and other plating work requiring an extremely adherent stop-off.

## UNICHROME "QUICK DRY" STOP-OFF 323

— a fast-drying, resistant lacquer that is easily applied and cuts cleanly at the edges — specially compounded for parkerizing, hard chromium and other plating work requiring a stop-off that can be readily peeled off after use.

## UNICHROME RESIST LACQUER BG

— a heavy bodied, resilient insulating lacquer that has excellent all-round chemical resistance — for hard chromium and parkerizing work requiring a stop-off that can be peeled off after use.

## UNICHROME STOP-OFF COMPOUND 311

— a solid wax-like formation that saves preparation time in stopping-off complicated shapes — suitable for work requiring resistance to boiling hot cleaners, acid dips and high temperature plating solutions.

## UNICHROME RESIST SHEET AND ROD

— a solid insulating material that is readily fabricated and extremely resistant to all plating room chemicals — specially suitable for constructing composite plating racks, stop-off shields, insulating gaskets, and lattices for preventing short circuits in anodizing tanks.

## UNICHROME INSULATIONS

are right for  
each stop-off and  
rack coating job!



Here are six tried and proved materials, each offering an unequalled combination of properties, each formulated to meet specific problems. For further details, prices or an initial order, write briefly stating your problem and the work for which the material is intended.

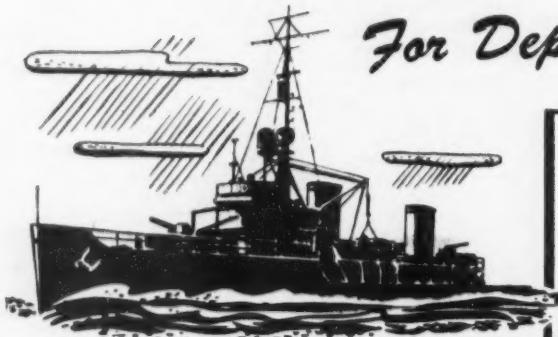
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INCORPORATED**

51 East 42nd Street, New York 17, N.Y.

Waterbury, Conn.      \*      Detroit, Mich.

# LEAD PLATED

*For Dependable Rust-Proof Service*



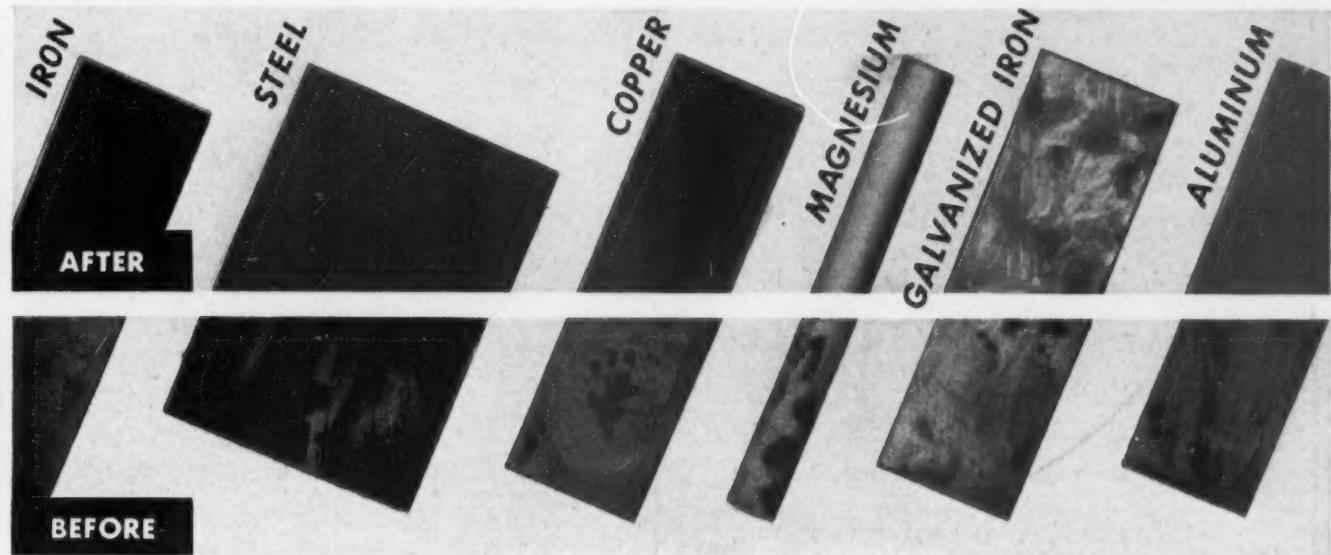
● Millions of small parts such as those shown below—formerly made of copper, bronze and other critical metals—are now being made of steel and lead-plated in our plant to make them corrosion-proof under the most severe conditions of war service. We invite your inquiries on lead plating work of this type.



## STEEL PROTECTION & CHEMICAL CO. INC.

★ ★ MOORESVILLE, INDIANA ★ ★

# Get results LIKE THESE



**WITH DIVERSEY**

# D-C No. 44

## HELP WANTED?

Here's one "help wanted" problem that's easily solved . . . even in these days of man-power shortages. If it's a problem in metal cleaning and working . . . the Diversey D-Man is always on deck to lend a helping hand. Backed by a Research Laboratory that has spent 18 years developing special purpose products, the Diversey D-Man can often show you ways to step-up production that require less man-power.



*A medium duty cleaner for iron, steel and copper; a general cleaner for magnesium and zinc alloys.*

Diversey D-C No. 44 is a dry, free-flowing concentrated product that gives excellent results over a wide range of cleaning operations. It is completely soluble and easy to use in still tank cleaning or mechanical metal washers.

D-C No. 44 has been specially developed for removing foreign matter from many types of soft metals. Its unusual saponifying and emulsifying action readily removes oil

and grease, while high wetting power quickly "lifts" solid contamination, thereby leaving a chemically clean surface.

Because of its unique water softening action D-C No. 44 prevents hard water salts from clinging to the work. It rinses freely and completely . . . leaves no film or scale. Furthermore, D-C No. 44 is buffered to retain its cleaning power over long periods of use.

*Send for complete details.*

METAL INDUSTRIES DEPARTMENT  
**THE DIVERSEY CORPORATION**

53 W. JACKSON BLVD., CHICAGO 4, ILL.



## *Cutting down ABSENTEEISM ...at the SOURCE!*

Helping reduce absenteeism is nothing new to Kirk & Blum. For more than 36 years, dust and fume control systems installed by Kirk & Blum have been protecting workers' health and increasing their efficiency.

We know that every dust or fume control system we install today is saving precious man hours, lowering costs, speeding production . . . helping to win the war. And this knowledge gives us a very special satisfaction that cannot be measured in dollars and cents.

If you are faced with any problem involving dust or fume control, it will pay you to get the unbiased counsel and planning of specialists . . .

Kirk & Blum Engineers. For details, write

THE **KIRK AND BLUM** MFG. CO.  
2859 SPRING GROVE AVE. CINCINNATI, OHIO

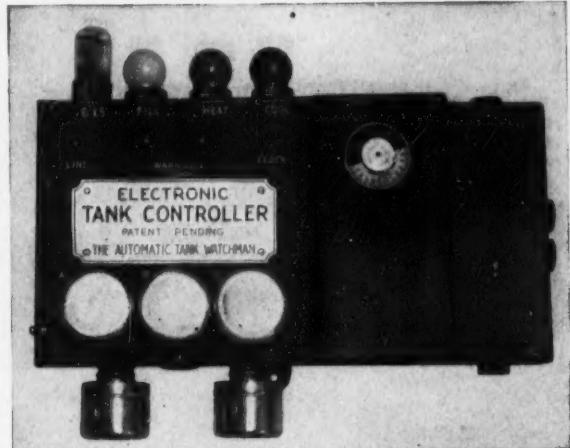
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STAINLESS AND ALUMINUM FABRICATION

# WHY?

## Buy just a Temperature Control



## *When this . . .* **Electronic TANK CONTROLLER**

*"The Automatic Tank Watchman"*

**provides** — leveling, leak detection, overflow warning and temperature control. All of these and many other features are combined in one instrument which can be obtained at no greater cost than what you would pay for a good temperature control alone.

Install one of these models on your plating tanks and start immediately to save manpower—material and unnecessary waste.

*Made in 3 reasonably priced models—Write for booklet giving full details.*

**PLATING PROCESSES CORP.**  
HOLYOKE • MASSACHUSETTS

NOW THAT ZINC HAS SO MANY  
MORE WAR JOBS TO DO . . .

# it's ANOZINC

NO DIP  
ELECTROPLATE

## for increased corrosion resistance

Have you switched from other metals to steel and zinc plating? Or from cadmium to zinc plating? Do you find it necessary to meet the requirements of specification AN-P-32, Revision 2? Then you will want to investigate ANOZINC!

With this treatment, you can increase the corrosion resistance of zinc plated on steel or other metals — get a more attractive finish as well. In fact, you can make a zinc plated finish suitable for countless applications where outdoor exposure, corrosion and handling are encountered.

Here in a nutshell is what ANOZINC offers.

**A fast, inexpensive method** of producing by anodic treatment, an attractive, resistant coating on zinc plating and certain zinc base die castings.

**For countless parts** now being plated or black finished, this treatment will mean improved appearance as well as longer service life. Parts finished in ANOZINC baths have stood up in excess of 200 hours under the Army-Navy salt spray test AN-QQ-S-91.

**Two attractive finishes** are available—a dark semi-lustrous black, and a brassy, slightly iridescent yellow—a different bath being used for each color.

**Existing plating facilities** in most cases, can be readily converted for use with this process. The constituents of ANOZINC baths are stable and can be easily controlled by any competent plater. The salts are inexpensive and no license agreement need be executed.

**For further information** write to the nearest office below, indicating the size, quantity and nature of the parts to be treated, the basic metal and type of zinc plating used. Your inquiry will receive immediate attention.

**UNITED CHROMIUM**  
INCORPORATED

51 East 42nd Street, New York 17, N. Y.

Waterbury, Conn.

Detroit, Mich.

# Leaders ON-THE-JOB FOR BETTER DUST SAFETY— BETTER COMFORT TOO!



THE TRANSPARENT

## Clear-Vue MODEL DUSTFOE RESPIRATOR

With facepiece and filter container of strong, transparent plastic, you can see inside this modern respirator at a glance. Officially approved by the U. S. Bureau of Mines for All-Dust protection, the Clear-Vue Dustfoe is durable, odorless, non-corrosive, non-conductive of electricity or heat. Its transparent construction permits checking for cleanliness, proper insertion and seal of filter, etc., without disassembly. The adjustable facepiece has a soft, molded face-cushion which provides maximum wearing comfort. Easily sterilized; all parts are interchangeable. Write for Bulletin No. CM-6.

non-corrosive, non-conductive of electricity or heat. Its transparent construction permits checking for cleanliness, proper insertion and seal of filter, etc., without disassembly. The adjustable facepiece has a soft, molded face-cushion which provides maximum wearing comfort. Easily sterilized; all parts are interchangeable. Write for Bulletin No. CM-6.

## M·S·A Comfo DUST RESPIRATOR WITH PLASTIC FILTER CONTAINER

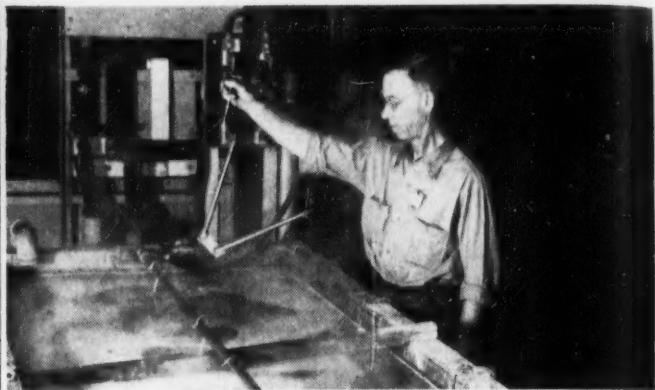
New plastic filter containers—thinner, with rounded edges—permit better downward and sidewise vision in the famous Comfo Respirator, plus even lower resistance to air-flow and improved appearance. Long a popular favorite in industrial service, the twin-filter Comfo is U. S. Bureau of Mines-approved for dependable dust protection—sturdy and durable for hard service. Rubber self-adjusting facepiece assures snug fit—simple to clean and sterilize. Ask for Bulletin No. CR-9.

Demonstrations Gladly Arranged on Request

**MINE SAFETY APPLIANCES CO.**  
BRADDOCK, THOMAS AND MEADE STREETS  
PITTSBURGH, PA.

# FLAWLESS ELECTROPLATING

Insured by New Double-Function Cleaner



COURTESY OF DOUGLAS AIRCRAFT CO.

**PROSOLV B Cleans physically and chemically . . .**

How clean is "Clean"?

Not clean enough in today's wartime zinc electroplating unless it includes both physical and chemical cleanliness.

Zinc plating, like cadmium or copper, will not adhere over traces of rust or scale. So—when work is cleaned for zinc plating—oxides, mill scale and corrosion products must be removed—as well as grease and dirt.

That's why TURCO'S new PROSOLV B cleaner is filling an essential need in American industry.

PROSOLV B goes to work in the cleaning tank like a fine precision tool. Its accurate, powerful action penetrates and removes grease and carbon smut, rust and scale. The resulting metal surfaces are physically and chemically immaculate . . . ready for a perfect plating job.

Try this specially formulated product that is solving plating problems in many warplants throughout the country. It is adaptable for practically any plant requirement because it can be used in any standard steel tank equipment.

SEND FOR DESCRIPTIVE LITERATURE TODAY

BUY WAR BONDS

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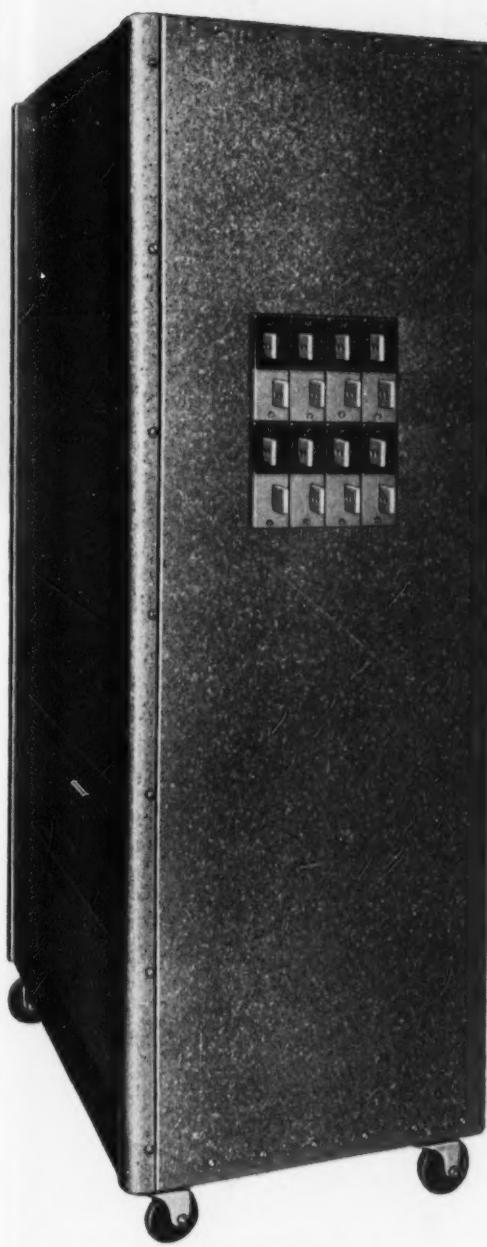
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# GREEN MULTI-PLATER MODEL 86



42" wide, 24" deep  
approx. 81" high.

## ALL IN ONE CABINET--

the MULTI-PLATER provides eight (8) separate selenium rectifier sections each having an output capacity of 6 volts 500 amperes.

For quick, simple installation and mobility, MULTI-PLATERS are mounted on casters.

Separate output terminals make it possible to connect each rectifier section to a separate tank, or several sections may be added together for higher voltage or greater current capacity, or *all* the sections may be grouped together in a single bank.

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6 volts 4000 amperes,  
or 12 volts 2000 amperes,  
or 24 volts 1000 amperes,  
or 48 volts 500 amperes.

Standard MULTI-PLATERS provide internal connections for operation from 220, or 440 volt 60 cycle 3 phase supply.

MULTI-PLATERS can be furnished for other supply voltages.

MULTI-PLATERS of lesser capacity than Model 86, as illustrated, are also available.

*Write Dept. F for illustrated booklet.*

**W. GREEN ELECTRIC COMPANY, INC.**

GREEN EXCHANGE BLDG., 130 CEDAR ST., NEW YORK 6, N. Y.

RECTIFIER

EST.



ENGINEERS

1892



Founded as *METAL INDUSTRY*,  
January, 1903 by  
PALMER H. LANGDON  
1868-1935

# METAL FINISHING

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DECEMBER, 1943

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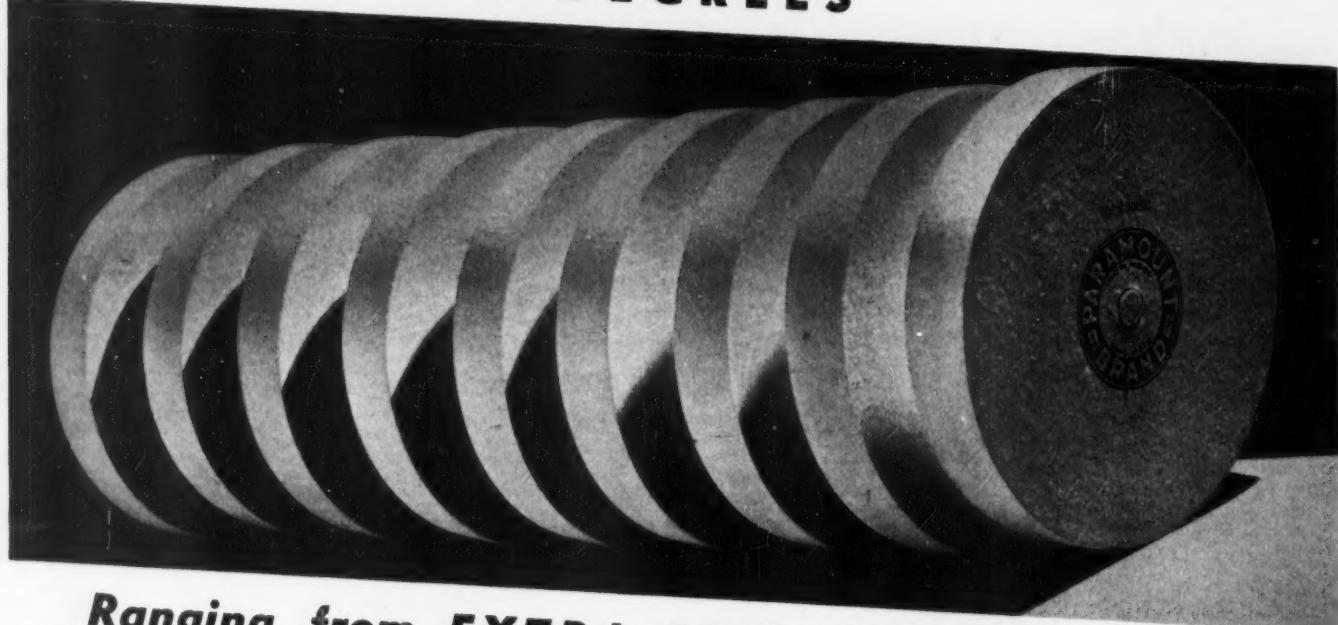
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PARAMOUNT  
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9 DEGREES



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THE manufacture of felt wheels is a craft with little use being made of mass production equipment. Human skill and human hands are still the controlling factors. That's why the phrase "oldest felt manufacturers in America" takes on a real meaning for those who buy and use felt wheels.

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We make felt wheels in 9 different degrees of hardness and in a wide range of diameters and thicknesses.

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*America's Oldest  
Felt  
Manufacturers*

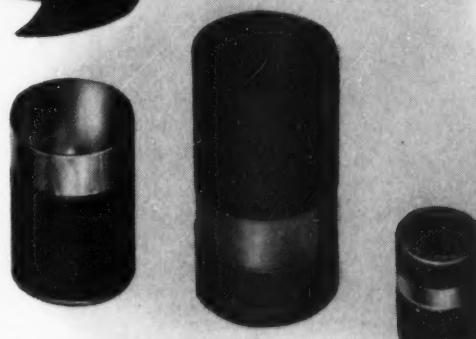
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1824

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for  
INSULATING PLATING RACKS  
and as a  
STOP-OFF



Applying Wrap-Rax  
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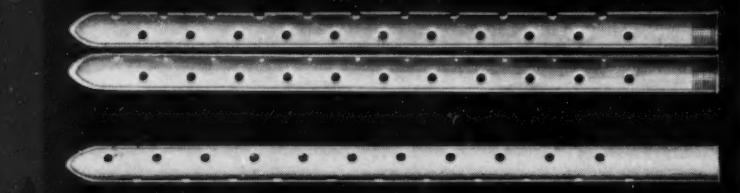
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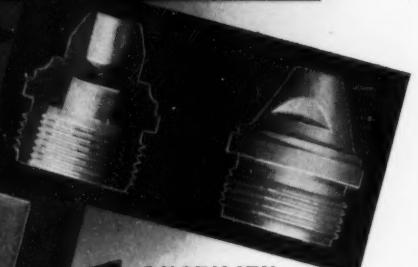
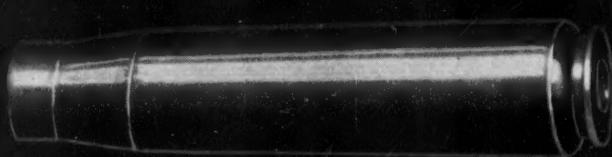
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## WPB's INTEREST IN WAGE INCENTIVE PLANS

American war production could be increased as much as 35 per cent through the best utilization of existing facilities and labor, John W. Nickerson, director of the War Production Board Management Consultant Division, told the Autumn Production Conference of the American Management Association last month.

Pointing out that a good share of this potential increase in production can be secured through sound wage incentive plans, Mr. Nickerson said that a detailed study of 17 typical cases in the New York region, covering group, individual, and plant-wide incentive pay plans, showed productive increases ranging from 10 to 100 per cent above past performance.

In nine of the cases—all of which had been submitted to and approved by the Regional War Labor Board—the increase over past performance was more than 50 per cent. Plants producing war items such as aircraft parts, electronic tubes, die castings, paper containers, lubricating coils, and precision optics were included in the study.

WPB's interest in wage incentive plans, Mr. Nickerson pointed out, flows from its interest in increased war production.

"Over a thousand managements have applied to the Management Consultant Division for assistance," he said. "This assistance takes the form of engineering advice. There is no dictation, no exercise of authority, no veto power. There is no opportunity for extended service such as is given by consulting industrial engineers. Our policy is to work with managements on the plans they have initiated with the object of evolving the soundest methods possible consistent with the critical need of production, the time element involved, and the effect on the stabilization program."

For completely satisfactory results, the WPB official declared, two fundamentals are necessary in any wage incentive plan: (1) proper technical principles and practices, and (2) an understanding and cooperative attitude between management and labor.

Although much of the difference between current production rates and those reasonably attainable is due to the lack of incentive plans, a good deal is also due to faulty incentive programs set up without consideration for these fundamentals, he added. "Such conditions need cure," Mr. Nickerson told the conference, "and in adding to our wartime incentives where often the necessary time for conservative study is unavailable, we all the more need the best scientific thought to bring about the optimum soundness consistent with the needs of the hour. . . . So in the case of incentives, in plants from which we are desperately in need of production we may need to pass over some of the technical details which in other times we would insist upon, and call upon management and labor to provide greater shares of leadership and cooperation. We should still use the ultimate of engineering knowledge but perhaps work to broader tolerances. Much care, of course, should be given to see that our correlation between effort and our measure of effort is positive and sufficient and that the reward is in reasonable proportion to this effort."

## CONSERVATION DIRECTIVE NO. 5B—CONSERVATION OF CADMIUM

This directive, as amended, prepared by the Operating Committee on Aircraft Materials Conservation, was approved on October 28, 1943, by joint action of the Army Air Forces, Navy Bureau of Aeronautics, and Aircraft Resources Control Office, Aircraft Production Board, and shall become effective upon promulgation. It replaces directive 5A (May 10, 1943).

### 1. Shortage of Cadmium

The supply of cadmium that is or will be available is inadequate to meet the requirements of the military Services, and that portion of the available supply allocated to aircraft is not sufficient to warrant use of cadmium plating in application where zinc, lead or other alternative surfacing materials make satisfactory substitutes.

Conversion from cadmium plating is to be accomplished with minimum

delay after it has been established that zinc, lead or other coatings can be satisfactorily substituted.

Directives and other instructions providing for substitution of other materials, primarily zinc, for cadmium in plating, previously issued by the Army Air Forces, and Navy Bureau of Aeronautics, as well as Directive No. 5A of the Operating Committee on Aircraft Materials Conservation, are hereby cancelled and superseded by this Directive No. 5B.

### 2. Specific Permissible Applications for Cadmium

(a) Where designated by drawings and specifications as approved by the Procuring Agencies (Army Air Forces, Materiel Command, Wright Field, Dayton, Ohio; Navy Bureau of Aero-

nautics, Washington, D. C.) cadmium may be used for plating as follows:

(1) Aircraft bolts, nuts, screws, and washers except self-locking nuts limited by design to applications under 250° F.,

(2) Carburetor and magneto parts,

(3) External parts of engines for combat aircraft not including attachments such as clips, clamps, and lugs which are not incorporated in the engine proper,

(4) Parts which in service reach a temperature of 500° F. or higher; or come into contact with other parts which reach that temperature,

(5) Parachute, safety belt, shoulder harness and bomb sling hardware,

(6) Grounding contacts such as washers, and other electrical contacts when the increased electrical resistance of zinc plated surfaces would be objectionable.

(Concluded on page 768)

## CONSERVATION BULLETIN NO. 6A—USE OF ZINC PLATING AS SUBSTITUTE FOR CADMIUM PLATING

This Conservation Bulletin No. 6A, issued October 28, 1943, replaces Bulletin No. 6 "Conservation of Cadmium," issued July 30, 1943. These conservation bulletins are prepared by the Operating Committee on Aircraft Materials Conservation and are designed to call to the attention of the aircraft industry general conservation problems and questions that require industry-wide support and action.

### 1. The Cadmium Situation

The most recent survey by the War Production Board indicates that the cadmium supply will not be sufficient to meet all future requirements. The aircraft industry uses approximately 50% of all cadmium consumed and directive 5B outlines the cadmium

conservation measures to be taken by the aircraft industry.

It is recognized that the problems involved in changing from cadmium to zinc plating are sometimes difficult and this bulletin is prepared to assist the aircraft industry in converting from cadmium to zinc plating. It would of course be much simpler if no conservation of cadmium were necessary but the problem exists and the aircraft industry must do its part in this program as it has met other similar troublesome material changes. The utmost cooperation of the industry is required and it is believed that substitutions that can be readily effected at this time will obviate the necessity for more drastic and less

desirable action in the future.

### 2. Comments on Value and Use of Cadmium and Zinc Coatings

Competent tests have established that zinc coatings are either equal to or slightly superior to cadmium coatings of equal thickness as a protection against exposure to weather in industrial, suburban, rural and seacoast atmospheres.

Cadmium is definitely superior to zinc of the same thickness when subjected to extended salt spray or to intermittent submersion in salt water. Such exposure conditions require the use of heavier zinc coatings.

Resistance to salt spray, as in the

standard salt spray test, is by no means a measure of resistance to atmospheric corrosion. Results from this test are applicable only under such service conditions as described in the preceding paragraph.

Where electrical grounding is involved, zinc may not make a satisfactory substitute for cadmium since the electrical contact resistance of a zinc plated surface is higher than that of a cadmium plated surface. Lead plating is satisfactory in this respect, but lead should not be used in contact with aluminum, magnesium or zinc. Substitution of either lead or zinc for cadmium in applications involving electrical grounding must be approved by the Procuring Agency (Army Air Forces, Materiel Command, Wright Field, Dayton, Ohio; Navy Bureau of Aeronautics, Washington, D. C.).

Caution must be used in plating parts such as springs and lock washers of high or medium carbon steel and subjected in service to significant alternating stresses. It has been reported that zinc cyanide baths cause injurious hydrogen embrittlement in such cases, although acid zinc baths and some proprietary baths appear to be satisfactory.

Zinc gives satisfactory service in contact with aluminum and its alloys, and protects aluminum from corrosion in the same way that it protects steel.

Zinc plating does not result in higher "build-up" than does cadmium on protruding edges such as on screws and bolts. Where more "build-up" takes place in zinc plating than in cadmium, it is because the zinc plating solution or plating conditions have not been properly selected or controlled.

Zinc plating is considered unsatisfactory in some applications where corrosion products which may be formed from zinc coatings may interfere with the normal functioning of the part or affect adjacent parts. (For this reason magneto and carburetor parts, for example, are permitted to be cadmium plated in Directive 5B.) The formation of white corrosion products on zinc plating may however be prevented or significantly retarded through suitable treatments as specified in amendment 2 of specification AN-P-32.

Supplies of zinc for purposes of substitution for cadmium in plating are adequate and permitted by the latest revision of W.P.B. Zinc Conservation Order M-11-b.

## 2. Factors Involved in Converting from Cadmium to Zinc

In connection with any changes from cadmium to zinc, the applicable specifications must be considered. These Army - Navy - Aeronautical specifications, AN-P-32, Zinc Plating and AN-QQ-P-421, Cadmium Plating, have been revised and accept minimum plating thicknesses of 0.0003" for cadmium and 0.0005" for zinc plating. These specifications also accept a thickness of 0.0002" for both zinc and cadmium on articles having integral parts which are threaded externally where the threads are a major portion of the article, and on parts where dimensional tolerances will not permit a coating of 0.0003" cadmium or 0.0005" zinc. They set no requirement as to thickness of plating for holes, recesses, internal threads and other areas where deposits cannot be adequately controlled under normal plating conditions. Except for platings of 0.0005" or greater in thickness, specification AN-P-32 covering zinc plating does not require that parts be subjected to the salt spray corrosion test when zinc plated. In addition, a plating thickness of 0.0002" is acceptable on steel washers, nuts, bolts, screws and studs, and will be allowed for other similar items of aircraft hardware where the specified thickness requirement may cause serious production delay. Strict adherence to specification requirements as outlined above should result in substantial savings of cadmium.

Among the other factors to be reviewed in converting from cadmium to zinc are the following:

Equipment requirements for zinc and cadmium plating differ in several respects. When a change is to be made, delay will usually be avoided through a careful check of the cadmium plating equipment available inasmuch as plating equipment is frequently not operated to maximum capacity, and estimates of additional requirements in changing from cadmium to zinc should not be based on previous output of cadmium plating but rather on the maximum plating capacity of the equipment available.

For equal thicknesses of cadmium and zinc (0.0002" cadmium to 0.0002" zinc) about a 60% increase in current and barrel capacity are required to maintain equal production.

Where necessary to increase thickness from 0.0003" cadmium to 0.0005" zinc, an increase of 165% in electric current is required to maintain the

same volume of production. Also the parts falling into this category are predominantly still tank plated and an increase of about 50% is necessary in tank capacity.

In general:

(1) The same cleaning and plating equipment and procedures used in cadmium plating are used in zinc plating;

(2) The labor requirement will not change materially;

(3) Rectifiers to meet increased requirement of direct current are available with little delay in delivery;

(4) Rearrangement of available electrical equipment may greatly reduce the need of additional equipment;

(5) Converting the cadmium solution and anodes for zinc plating need involve no great difficulties if the simple precautions given below are taken.

## 3. Suggested Procedure in Converting Facilities

Inasmuch as there has been considerable discussion of the problems involved in converting from cadmium to zinc plating the following suggestions may be helpful:

(1) Remove the anodes from the tank. If ball anodes are used, empty the containers and hang them back on the anode rods.

(2) Connect the anode rods to the tank itself and continue cadmium plating as usual until (a) the tank sides and ball anode containers are stripped of any adherent cadmium (this is important to prevent contamination of the zinc solution), and (b) until the quality of the cadmium plate deteriorates below a point of acceptability (use of progressively lower current densities will extend this time period and should be used when production schedules permit). Store or dump the solution as is the more desirable in each individual case.

(3) Clean the tank and anode containers by scrubbing with water. Chisel off any remaining cadmium or dissolve it with some dilute nitric acid, but do not burn or melt it off (cadmium fumes are a deadly poison). Use the same precautions with plating barrels.

(4) Prepare a fresh zinc cyanide solution and place the necessary zinc anodes in the tank.

If after converting the equipment, it is found that cadmium anodes on hand are in excess of three months' supply, sell them to the Metals Reserve Company through its agent, the Udylite Corporation, Detroit, Michigan.

### 3. Specific Non-Permissible Applications for Cadmium

(a) Cadmium shall not be used, regardless of specification or drawings, except upon certification of engineering necessity by the Procuring Agency for:

- (1) Propeller parts, except where electrical contact may necessitate the use of cadmium,
- (2) Landing gear parts,
- (3) Self-locking nuts limited to design to application not exceeding 250° F.,
- (4) Fittings,
- (5) Brackets,
- (6) Tools,
- (7) Cowl fasteners,
- (8) Ignition harnesses except where electrical contact may necessitate the use of cadmium,
- (9) Hydraulic actuating cylinders,
- (10) Vibration insulators as used for engine or equipment mounting,
- (11) Other parts as may be specified in future revisions to this directive.

### 4. Conversion from Cadmium in Applications Not Listed Above

(a) Zinc or other acceptable coatings other than cadmium may be used for exterior parts of amphibian and seaplanes upon the approval of the Procuring Agency (Navy Bureau of Aeronautics, Washington, D. C.). Zinc coatings in this application shall not be less than .001" thick.

(b) Contractors are cautioned against wastage of cadmium through over-plating. Requests for allocation of cadmium will be reviewed to insure that only the minimum quantity of cadmium necessary to maintain production of essential items is being requested. Continued use of cadmium in applications where zinc has been approved will not be tolerated after it has been determined that substitution is practicable from production and engineering standpoints.

(c) Contractors shall inform the Services (Army Air Forces, Materiel

Command, Wright Field, Dayton, Ohio; Navy Bureau of Aeronautics, Washington, D. C.) upon determination of additional conversions from cadmium in order that they may be made generally mandatory, after receiving Service approval.

### 5. Other Considerations — Cadmium and Zinc Plating

(a) To assist contractors in making conversion from cadmium to zinc, Conservation Bulletin No. 6A has been issued by the Committee and should be consulted in connection with the provisions of this directive.

(b) Zinc shall not be used where corrosion products might interfere with normal functioning. For this reason, magneto and carburetor parts are permitted to be cadmium plated as noted in paragraph 2(a). However, the formation of white corrosion products will be prevented or significantly retarded through suitable treatment such as specified in the latest revision of specification AN-P-32.

(c) Caution should be used in parts made of high or medium carbon steel as plating in certain types of zinc cyanide baths is reported to result in hydrogen embrittlement. Acid plating, and possibly certain proprietary baths, may not be objectionable in this respect.

### 6. Use of Protective Coatings Other Than Zinc Electroplate

Sprayed and hot dipped zinc coatings and lead may be suitable in many applications and their use should be investigated. Consideration should be given to the use of phosphating treatments, followed by appropriate primer and paint schedules. However, the use of coatings other than zinc electroplate must be specifically approved for the intended application by the Procuring Agency (Army Air Forces, Materiel Command, Wright Field, Dayton, Ohio; Navy Bureau of Aeronautics, Washington, D. C.).

### 7. Revised Army - Navy Aero-nautical Specifications

Specifications have been revised to reduce minimum plating thickness to 0.0003" cadmium and 0.0005" zinc in general applications, and 0.0002" cadmium or zinc where external threads form a major portion of the article or where close dimensional tolerances will not permit greater thicknesses. In addition, a plating thickness of 0.0002" is acceptable on steel washers, nuts, bolts, screws and studs and will be allowed for other similar items of aircraft hardware where the specified thickness requirement may cause serious production delay. Strict adherence to specification requirements as outlined above should result in substantial savings of cadmium. No minimum is provided for holes, recesses, internal threads and other areas where thicknesses are subject to incomplete control under normal plating conditions. The salt spray test is no longer required on such parts when zinc plated with thicknesses of less than 0.0005".

### 8. General

It is incumbent upon the contractor to comply with this directive by initiating action in accordance with the contractual provisions governing changes and costs at the earliest practicable date.

Where compliance with this directive will interfere with production or where the substitutions required herein will in the opinion of the contractor adversely affect performance or reliability the contractor shall bring such items to the attention of the Services.

### 9. Changes Introduced in this Revision

Through this revision, continued use of cadmium plating for aircraft bolts, nuts, screws, and washers, other than self-locking nuts limited by design to applications under 250° F. is permitted in Paragraph 2(a)(1). Other changes are for purposes of emphasis and clarification.

# Black Nickel Plating

By J. G. POOR

Underwood Elliott Fisher Co., Hartford, Conn.

## PART II

### Corrosion Resistance

Contrary to the understanding of some workers, substantial thicknesses of uniform, lustrous, black nickel may readily be deposited. Some of the deposits obtained in the experiments already described were over 0.005" thick. However, in most cases it would probably be impractical to deposit an appreciable thickness on commercial articles because the coating is inherently brittle and will not withstand bending. Thin deposits, as produced commercially by plating at about 1½ amp./sq. ft. for 30 minutes or by plating at about 10 amp./sq. ft. for five minutes, will withstand moderate bending but because of their extreme thinness the corrosion resistance can hardly be expected to be very great.

As a preliminary study of the corrosion resistance of black nickel and of black nickel composited with other protective coatings, five-minute black nickel deposits were plated upon the following: Directly on cold rolled steel; over 0.0002" cadmium on steel; over 0.0002" zinc on steel; over 0.0005" cyanide copper on steel, and over 0.0005" nickel on steel. Exposure tests were conducted in the salt spray box, in a humidity cabinet, and out of doors on the laboratory roof.

It was found the best resistance to spotting and discoloration was obtained using nickel as an undercoating. Copper, as an undercoating, definitely appeared to accelerate the corrosion of the black nickel and generally brought about the appearance of extraordinary amounts of the white corrosion product. Zinc and cadmium undercoatings increased the amount of white corrosion product formed, probably by corroding themselves, especially in the salt spray. The black nickel directly on steel showed a slight protective action and appeared to be decidedly anodic to the steel. Zinc or cadmium undercoatings might safely be used with black nickel from the standpoint of discoloration and corrosion. Scratching or marring of the finish, however, is more likely with these relatively soft metals.

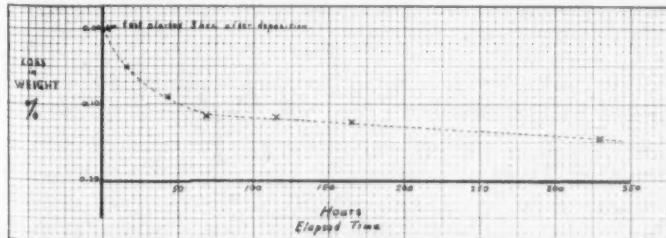


Fig. 4. Showing loss in weight ( $\text{NH}_3 \div \text{H}_2\text{O}$ ) on standing over  $\text{H}_2\text{SO}_4$  at room temperature.

### Composition of Deposit

The problems of determining some of the properties and the composition of the black nickel deposit were greatly simplified by being able to produce coatings of substantial thickness. Coatings for this work were produced in the standard bath which had been made up using C. P. chemicals. Deposition was upon thin, stainless steel sheet from which the coating could be readily flaked by bending and light scraping. The conditions during deposition were: Temperature, 120 to 130°F.; pH value 5.6 to 5.9; average current density 10 amp./sq. ft.; time of deposition, 1 hour per cathode. The deposit from several cathodes was collected together and reduced to small particle size by light grinding.

Element	Analysis	Simple Ratio	
		% At. or Mol. Wt.	Molecular Weights
Sulfur	8.20%	.255	2.0
Nitrogen	3.54 "	.253	2.0
Nitrogen, as Ammonia	4.30 "	.252	2.0
Carbon	4.54 "	.377	3.0
Nickel	23.02 "	.392	3.1
Zinc	48.1 "	—	—

Fig. 5. Analysis of deposit.

### Effect of Heat

Heating some of the deposit in an ordinary test tube first caused a very surprising thing to happen. A considerable amount of ammonia gas was given off at a great rate of speed. Continuing the heating caused water to be driven off and finally at quite a high temperature, a further decomposition took place with the evolution of gases presumed to contain sulfur compounds.

By heating in a closed system and raising the temperature at a uniform rate, it was determined that the sudden and rapid evolution of ammonia gas takes place at about 175°C. or at about 350°F. The manner in which such heating affects the structure of deposits will be shown in illustrations to follow.

These results certainly indicate that black nickel should not be heated at temperatures approaching 350°F. in any commercial practice such as in the baking of lacquer films.

### Reactions

Black nickel was found to react vigorously with dilute hydrochloric acid with the evolution of hydrogen and some hydrogen sulfide. Complete solution of the material took

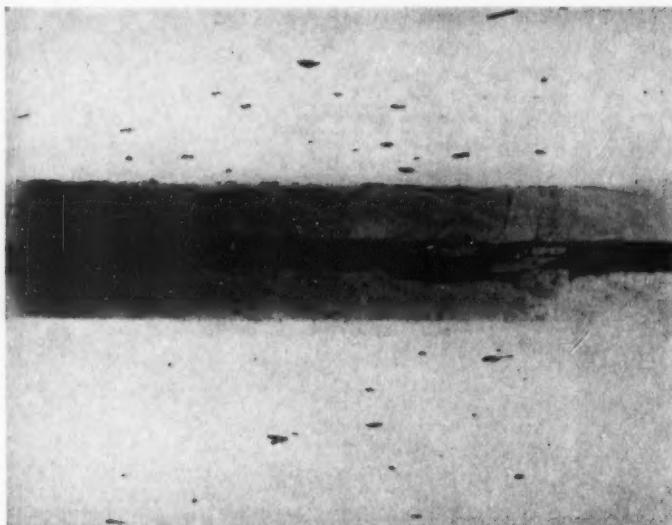


Fig. 6. Cross section of polished black nickel deposit on hard brass.

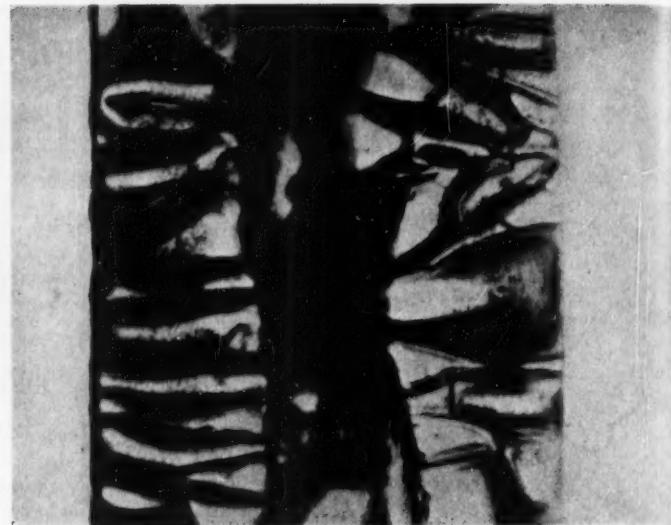


Fig. 8. Higher magnification of Figure 7.

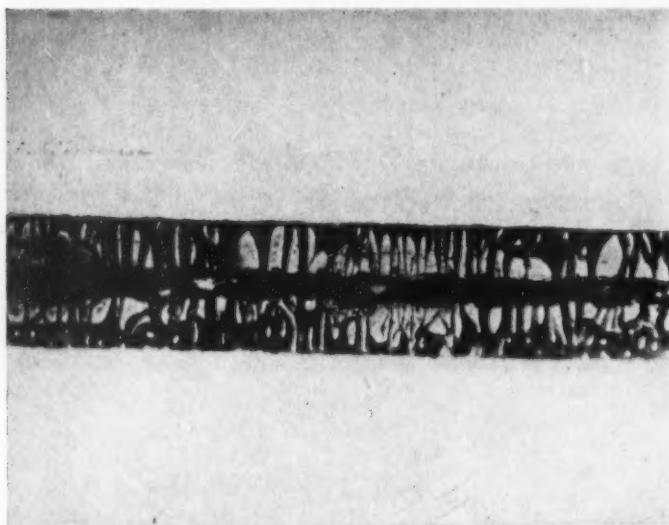


Fig. 7. Black nickel deposit etched with half normal HCl.

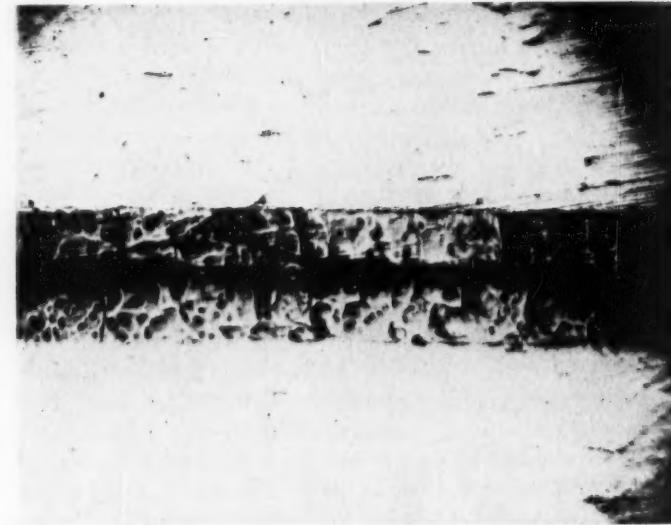


Fig. 9. Black nickel deposit polished and baked. Note ammonia "bubbles".

place on prolonged heating. In warm sodium hydroxide solution hydrogen was again rapidly evolved and upon heating more strongly, ammonia was also given off.

#### **Evolution of Ammonia at Room Temperature**

It was discovered that black nickel evolves a small amount of ammonia at room temperature after having been freshly deposited. A quantitative measurement of the loss in weight due to this evolution of ammonia, and probably to a loss of adsorbed moisture as well, was carried out by storing freshly deposited material over sulfuric acid in an ordinary desiccator and weighing the samples at intervals. Results are shown in Figure 4.

#### **Analysis of Deposit**

A careful quantitative analysis of the deposit was carried out with the results shown in Figure 5. It is believed that this may be the first time that the amount of carbon and nitrogen or ammonia of such deposits has been determined or reported. Other analysts have obtained a percentage composition quite different from the one obtained here. The

range of composition reported by others is: Nickel, 40-65%; zinc, 7-25%; sulfur, 7-15%. The reactions of the deposit strongly indicate that most, if not all, of the zinc is present as metal. It may be quite significant that nickel, carbon, sulfur, and nitrogen or ammonia, are present in very nearly the exact proportions obtained by taking three atoms of nickel, three atoms of carbon, two atoms of sulfur, and two molecules of ammonia. With considerably more work on analyzing the deposit and determining the electrochemical equivalent of the substance, it may be possible some day to determine the reduction reaction and exact nature of the deposit.

#### **Structure**

For microscopic examination black nickel was deposited upon hard brass under the same conditions as for the analysis of the deposit except that the plating time was 45 minutes. To avoid heating, the specimen was not mounted in plastic for sectioning. Instead, two pieces of the cathode were firmly bolted together having the two plated surfaces in close contact. Figure 6 shows the deposit cross-sectioned and polished but not etched. After trying several etchants

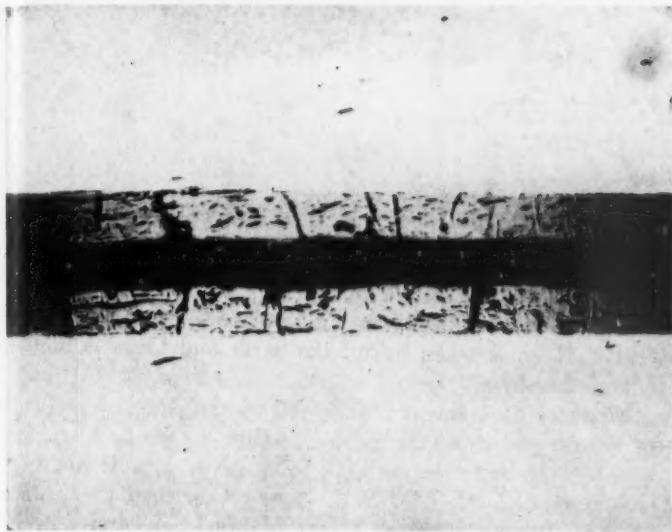


Fig. 10. Heated or baked specimen repolished. Note cracks in deposit.

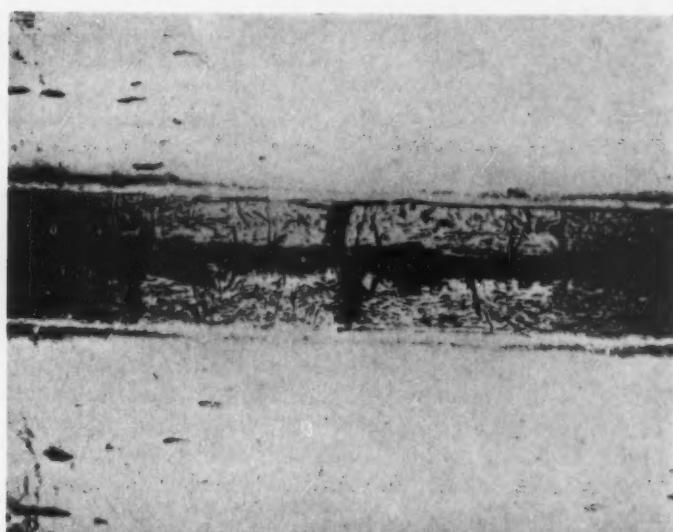


Fig. 11. Baked specimen after etching in tenth normal HCl. Note crystal-type structure.

Figure 9 shows black nickel which has been polished and then baked for 1½ hours at 175-180°C., at which temperature ammonia is evolved from the deposit. What appear to be bubbles or blisters are seen on the surface of the cross-section. In Figure 10 the heated or baked specimen has been repolished and what appear to be voids run all through the deposit. The number of cracks extending down to the base metal has increased and they appear to be greater in size.

Figure 11 shows the baked specimen after etching in tenth normal hydrochloric acid. The pattern is considerably different from that obtained with the unbaked specimen and what might be a crystal structure can be seen. Figure 12 shows the same specimen at higher magnification. Kersten and Maas<sup>3</sup> have shown evidence of a definite crystalline structure after heating their deposits; however, the temperature they employed was very much higher than we have used.

In conclusion we wish to acknowledge the efforts of Mr. A. W. Faucher of our laboratory, who carried out much of the work in exploring the plating range and characteristics of the black nickel bath which we have reported in this paper.

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2. Langbein, "Electro-deposition of Metals"
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no evidence of a definite crystal structure could be resolved. Using half normal hydrochloric acid as an etchant, a peculiar pattern was developed and is shown in Figure 7.

It is believed that the pattern shown here may be due to preferential attack along hair-line cracks running through the deposit. The same structure is shown at higher magnification in Figure 8. Kersten and Maas<sup>3</sup> have shown by means of X-ray studies that black nickel deposits are amorphous in structure and it is believed that all of the microscopic evidence we have seen points to this.

# The Antiquity of Tools

By JOSEPH DANFORTH LITTLE

## PART IV

### Tools in the Bronze Age

DURING the Bronze Age many developments appeared in tools as well as in other domestic utensils but they all seem to have been derived from primitive prototypes in stone. Comparatively few entirely new tools suggested themselves to the men of that age. In the very early days of the Stone Age men fashioned their stone tools exclusively by a chipping technique. After the Stone Age came the Bronze Age, a name commonly applied to that stage of human development during which the alloying of copper with tin in regular proportions became a widespread practice and the material thus obtained was used for tools and weapons as a supplement to or a substitute for stone. The term has no chronological value but marks a period of civilization through which the people of Europe, North Africa and many parts of Asia and also Central America, passed at one time or another.

In the beginning of the Bronze Age, metal was relatively scarce; so stone tools were still used for many purposes. It is generally believed that bronze was first used about 2,000 B. C. or perhaps a little earlier. In this age people who held copper mines held power for tools of this new metal were so desirable, that any one who had the material to make them could trade it for whatever else he wanted. People who could make tools and weapons could accomplish many things that the Stone-Age man could not; so in the Bronze Age, civilization began an accelerated stage of development.

History does not record the name of the one who first thought of mixing copper and tin to make bronze but there are a great many legends about how the first Age of Metals began. The first metal tools were made of copper without tin. One of the legends tells, that copper was discovered when some early man watched a fire he had built and thought he saw stones melting and a bright, hot liquid forming in pools on the ground. When the fire died down and cooled off, he saw that the "liquid" had hardened again and where it had run down on the sloping ground it had taken the shape of the groove in which it ran. He had unconsciously made what might be considered the first bronze casting, for what he thought were rough stones were really pieces of copper. Later he found that this material made tools and weapons far better than those made of stone. For many years it was thought that the ancient people of Egypt had a secret method of hardening copper until it was like steel and that their method was supposed to have been lost, but we are now told that there is no way of hardening copper and it never can be made as hard as steel.

As the use of copper increased it was found that the supply of ore on top of the ground was inadequate so men learned to follow the veins of ore into the earth. Mines began to be dug far into the earth and the miners learned to split large rocks by heating and then throwing water on them. Georgius Agricola, in his book "De Re Metallica," written in 1556, describes and illustrates this operation.

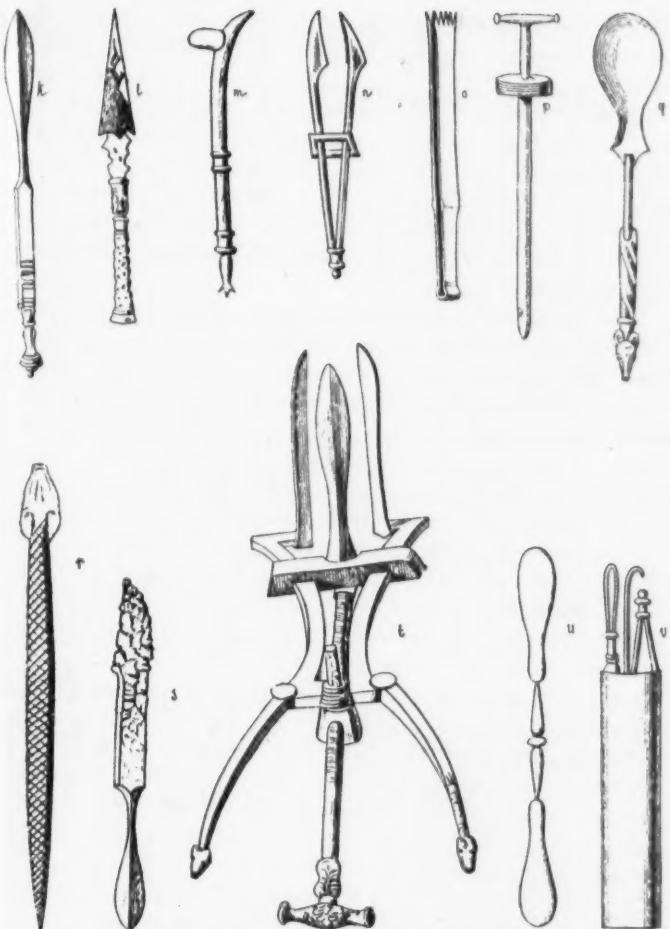
In the Book of Job, as to the date of which there is some

diversity of opinion, we find evidence of a considerable acquaintance with metals for in Chapter 28 it reads: "Surely there is a vein for the silver, and a place for gold where they find it. Iron is taken out of the earth and brass is molten out of the stone."

Many of the ancient writers tell us that their arms were of bronze and it is safe to assume that if they had arms of bronze they had tools as well, for arms and tools are very closely related. In 950 B. C. Homer described the bronze axe of Pisander and the arrow of Meriones, and tells us that the sword of Memnon in the Temple of *Aesculapius* was wholly of bronze. In Homer there is constant mention of arms, axes, and adzes of bronze. At the foundation of a city the Tuscans plowed the poerium with a bronze plow-share while the priests of the Sabines cut their hair with bronze knives and the chief priests of Jupiter at Rome used shears of the same material for that purpose. Agathachides related that in his time (circa 100 B. C.) there were found buried in the gold mines of ancient Egypt, the bronze chisels of the old miners, and he accounts for their being of that metal by the fact that at the period when these mines, which were old in his day, were worked, the use of iron was entirely unknown. Many centuries before Columbus discovered America it was inhabited by a race of people as free as the air they breathed and who were lords of all they surveyed. When Columbus landed he found the natives wore copper earrings and bracelets. The use of copper for arrow-heads among the Indians of Massachusetts, at the arrival of the white man, is well authenticated.

On some of the shores of Lake Superior native copper occurs in great abundance and evidently attracted the attention of the early inhabitants of that section of our country. These early people, accustomed to the use of stone, without doubt regarded the metal as merely a stone of a peculiarly heavy nature. On attempting to chip or work it into shape, they doubtless discovered at once that it yielded to a blow instead of breaking. The North American savage was able to produce spear heads with sockets adapted for the reception of their shafts by merely hammering out the base of the spear head and turning it over to form the socket, in the same manner as is often employed in the making of iron tools. All prehistoric copper tools found in this country, are said to have been made entirely by hammering native copper, unheated. The State of Wisconsin is particularly rich in implements of stone and prehistoric copper.

It is interesting to note how long men remained on the brink of invention. Copper wire had been made by cutting and hammering from as early as 5,500 B. C.; yet the drawing of wire remained unknown for 6,000 years or more. Just when the first drawn wire was made is indefinite but it was not known to the Romans. Thick beaten wire was made into chains with rounded links as far back as the second dynasty (5,200 B. C.) and links doubled up and looped through each other, appeared in the sixth dynasty (4,200 B. C.); yet the chains were not commonly used until much later.



Surgical instruments from Pompeii which were buried with ashes from the volcano Vesuvius in the year 79 A. D.

### The Iron Age

John Locke, who lived over two hundred years ago, said: "Were the use of iron lost among us we should in a few ages be unavoidably reduced to the wants and ignorance of the ancient savage American; so that he who first made known the use of that mineral may be truly styled the Father of Arts and the Author of Plenty." After the Bronze or Copper Age came the Iron Age. It normally followed the Bronze Age, when that metal was used not only for objects of luxury as it is today, but also for household and agricultural implements. The earliest known examples of iron in Egypt is the group of oxidized iron beads, found by Wainwright at El Gerzh which had been dated about 4,000 B. C. There is documentary evidence of the authenticity and early date of an iron tool found inside the great pyramid of Khufu at Gizeh dating from the fourth dynasty or about 3,100 B. C. The earliest iron objects in Egypt are chiefly weapons and ornaments. When iron for tools was discovered, it changed the world almost as much as those of bronze had done, for up to the time bronze was introduced, people had used stone tools and weapons. We do not know when or where the use of iron began. Iron ore is quite common all over the world and it is not difficult to get the metal from the ore.

Sacred scripture (Gen: 4:22) tells us that *Tubal-cain* was "an instructor of every artificer in brass and iron." He was the first outstanding worker in iron that we have any record of. The Assyrians brought the ironsmith's art up to a very high point. An Assyrian king went over to conquer the Egyptian people some 2,500 years ago and left there a whole

set of iron tools. The Philistines were the early smiths of Palestine. Evidently they were not inclined to teach the Jews the art of working in iron, for we read that the Jews had to go down to the Philistines "to sharpen each man his share, and his coulter, and his axe and his mattock" (1 Sam. 13:22) and without doubt the Philistines charged the Jews plenty for this service.

The Greeks and the people of India knew about casting iron at a very early date. The early tools that were made of iron followed the general shape of the tools made in bronze and stone. In England there have been found daggers, spearheads, swords, knives, hooks, sickles, saws, gauges, adzes, files, bolts, nails, rivets, keys and bits, which hark back to the Iron Age (about 800 B. C.) The iron-headed pick in use today owes its form to, or, in other words, is a descendant of the primitive pickaxe, made from the antler of the deer.

Captain Cook tells us that when he first sailed into the South Seas on his voyage of discovery he found the natives using very primitive and clumsy tools. The principal tools were of wood and stone. Their adzes and axes were of stone. The gouge, most commonly used by them, was made out of the bone of a human forearm. Their substitute for a knife was a shell or a bit of flint or jasper. A shark's tooth fixed to a piece of wood served for an auger. A piece of coral was used for a file and the skin of a stingray was used for a polisher. Their typical saw was made of jagged fishes' teeth fixed on the convex edge of a piece of hard wood. Their weapons were of a similarly rude description. Their clubs and axes were headed with stone and their lances and arrows were tipped with flint. These stone tools and implements, he tells us, were fashioned by rubbing one stone against another until they were brought to the required shape but, after all, they were found to be very ineffective for their purpose. They soon became blunted and useless and the laborious process of making new tools had to be begun again.

Iron to them was a revelation and whoever among them was so fortunate as to obtain possession of an old nail, immediately became a man of greater power than his fellows and assumed the rank of a capitalist. An old chief who had bartered for two nails received no small emolument by renting the use of them to his neighbors for boring holes when their own methods failed or were too tedious. He tells us that a nail would buy a good sized pig.

The broad axe or adze of years ago no longer hacks logs into squares for rafters, studs, and beams. No longer is it necessary for the carpenter or ship builder to order his hand-made nails from the blacksmith at a few pennies each. In early days hardware was purchased from the blacksmith who hammered out each piece from his stock of iron or steel. These men knew their jobs and did them well. No longer do we use a pit-saw for cutting logs into lumber. One hundred and fifty years ago it was not uncommon for lumber to be felled and then cut with a pit-saw. This saw measured about seven feet in length. One man stood in an open pit, to pull down, while another man from above, guided and operated the pit-saw for the entire length of the log. By this tedious process, repeated many times, a log was sawed into planks and boards. The carpenter later planed and smoothed them by hand for his building material.



Solid silver punch bowl hammered up from a flat sheet of silver and hand decorated. Not a mechanical tool was employed in making or decorating this bowl, hand hammers having been used to do all the work.

### The Hammer

Among the contrivances which have come down to us from those ages long before history was written or the use of metals known, are found stones shaped, we may suppose, by the action of water and so rounded as to fit the hand. These stones are called "mauls" by antiquarians and they were probably held in the hand and struck against that which otherwise could not have been broken. In these mauls we have the original hammer, which is the most ancient, primitive and universal of tools used by prehistoric man.

In all parts of the world and among all people, hammers may be found in use. A tool more simple and more useful than the primitive or handcraft hammer can not be imagined. Hammers, hatchets, the adz and similar tools were made in crude forms long before the use of metals was understood. The broad circular celt known as the adz is the prototype of the carpenter's axe and adz with which he cuts down trees and hews timber. Simple as the hammer is, it is a thing which had to be invented at one time and the first ones had no handles. Among the first indications of improvement on the smooth stone, were the cup-shaped holes gouged out so that a firmer grip could be secured with the fingers. This was a Swedish contribution to progress, back in the Stone Age. The first hammers with handles were very crude, consisting of sticks tied on or pushed through holes bored in the stones. In the Museum of the American Indian in New York City may be seen a very effective hammer with a grooved stone, about which a bison's sinew was passed and over which a large band of bison skin was drawn and attached to the handle. This was sewed on while fresh, so that when it dried it formed a tight grip and connection.

The hammer was man's first shaping tool and with the advancement in its application during the centuries, the hammer continues to hold its place. In modern metal working the hammer is supreme. Its form has changed from time to time but whether the hand tool or the power driven hammer be considered, the principles underlying its use are still the same. The simplicity and effectiveness of the hammer has never been equalled or exceeded by any other tool. Whether metal be worked hot or cold, the hammer is truly called King of Tools. Not only does it produce a vast amount of work with a small amount of force expenditure

but it gives to the metal qualities obtainable in no other way. Strength, rigidity, solidity and increased elasticity are all gained under the hammer, while in the cases of iron and steel, a type of surface hardness is secured which can not be produced in any other manner. The axe, which is a hammer with a sharp edge, is the most common of all edged tools. Of all cutting tools, the axe is probably the oldest and for thousands of years it was the one most used. Today, however, comparatively speaking, the axe is seldom used.

The hatchet also is a very old tool. Stone hatchets have been found in the graves of the earliest men of whom we have any trace. These men laboriously cut their heavy, clumsy hatchets out of hard stone and it was this use of stone-bladed tools that led students of these people to call them Stone Age men, or men who used stone tools. Stone Age men evidently also tied the blade to the hilt with cords for we can see the groove cut in the stone for the cords.

The hammer is the best known tool in the workman's tool-chest or kit. In the tool-makers' catalogue of today there are many hammer heads shown which are but very slight advances on the earliest known stone hammers of primeval man. In many instances stone implements are the parents of metal forms. The hammer and knife were the original tools of early man. The axe, the saw and the needle are also tools that have come down to us from men who lived long centuries ago in unknown lands. Today the hammer, whatever its type or use, is a splendid tool, admirably designed for special work. It is the finest tool of percussion ever made. Our present day pile driver is only a machine hammer and a drop press is just another type of hammer. The trip hammer was introduced and used in England in the 17th century.

In some handcrafts involving a high class of finished work the hammer is the only tool employed. Great artistic skill in the use of the hammer as a finishing tool, can be acquired and this is best illustrated in beautiful, hand-made sterling silver ware, repousse chased. The punch bowl shown in the illustration was hammered up from a flat sheet of silver, without the aid of any mechanical tool or stamping machine, either in its making or decoration. The details of the ornamental work are not only minute but they are so harmonized as to give elegance and expression to the whole.

For examples of the use of hammers, in the production of works of great variety and extent on a large scale, one may examine the ancient hammer-wrought iron gates, hinges, and panels on display in the Metropolitan Museum of Art in New York City and also those in the South Kensington Museum of London. The nature of work to be done by hammers calls for very great differences, not only in the form, material and weight of the hammer head but also in the appendages to these. The objects to be accomplished by the blows of the hammer are more varied than those to be effected by any other single tool, when we consider the hammer as used by the engineer, the stone breaker, the mineralogist, the plumber, the glazier, the coppersmith, the stone mason, the dentist, and hosts of others. In the last journals of Dr. Livingstone he mentions that on one occasion in Cape Colony he saw a Bushwoman using a round stone with a hole through it as a digging hammer. Through the hole a rod had been inserted. The end of the rod was used for digging and the weight of the stone assisted the muscular effort. He states that these people prefer stone hammers and anvils because they do not burr up as iron ones do.

# Use and Misuse of the Salt Spray Test as Applied to Electrodeposited Metallic Finishes

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THE basic feature of salt spray testing, as the name implies, consists of exposing suitable specimens to a fog or mist formed by atomizing a solution of common salt. The test was originated by Capp<sup>1</sup> some 29 years ago for the purpose of determining in an accelerated manner, the relative corrosion resistance of coatings intended for use in sea coast atmospheres. Since that time its use has been extended widely. From the point of view of the engineer concerned with finishing it would appear that now the test is considered by many specification writers as an all-purpose accelerated corrosion test with the implication that coatings which will pass this test are satisfactory, while those that will not are no good and should be rejected.

The introduction of the salt spray test to industry was occasioned largely by the incorporation of salt spray test requirements in various Government specifications in an effort to insure a quality of product capable of withstanding the relatively severe conditions of the armed services.

Prior to the start of current world hostilities the test was undergoing a healthy but slow process of development. Its advantages and limitations were being investigated, its shortcomings resolved, and its usefulness extended where it was demonstrated this was justified. During this period it slowly gained many ardent supporters. However, it also experienced considerable opposition largely on account of the lack of uniform methods of operation and the failure to control important variables associated with the test, together with certain premature and erroneous predictions based on the results of the test. In the field of metal finishing there are many who even now question the ability of the test to yield reproducible results when applied to the wide variety of possible coating—basis metal combinations, and emphasize the lack of experimental evidence proving that satisfactory reproducibility can be obtained or that suitable correlation exists between salt spray test results and actual service behavior.

The relatively rapid and widespread conversion of industry to war production with the attendant increase in the use of those Government specifications containing salt spray test requirements has thus inadvertently forced a greatly increased use of a test which, in the considered opinion of many, is of doubtful merit. As a result the familiar old arguments for and against salt spray testing have come to the fore, misapplications of the salt spray test have been alleged, misinterpretations of the results have been frequent, and unfortunately, because of the general confusion, the production of important equipment has been impeded. It is the purpose of this paper to point out the accepted uses and limitations of the salt spray test together with the pertinent factors which should be con-

sidered in establishing salt spray test requirement in specifications.

## Uses of the Salt Spray Test

It is generally agreed that other things being equal the protective value of electropositive (cathodic) metallic coatings is a function of their thickness and an inverse function of their degree of porosity, while the protective value of electronegative (anodic) coatings is directly proportional to their thickness. Thus to the extent the salt spray test is capable of measuring these properties, it may be considered a measure of the protective value of metal coatings. The protective value of any particular coating, however, varies considerably with the environmental conditions to which it is exposed. Therefore, if the salt spray test is to be of value in determining whether or not any particular coating is suitable for any particular application, correlation of the test results with service performance must be established.

The incorporation of salt spray test requirements into A.S.T.M. Tentative Specifications A 166-41 T and B 142-41 T<sup>2</sup> covering nickel-chromium and copper-nickel-chromium coatings on steel and zinc, respectively, is evidence that the test is considered of value by many for controlling the quality of these particular coating—basis metal combinations. In these cases, it will be observed, the test is used to reveal the continuity of the coatings, which are known to be electropositive to the basis metal in the presence of the salt solution. In regard to this use of the test, the corrodibility of the coating itself must be considered and in some instances the salt solution probably creates some pores which initially were only relatively thin spots. While this is important when the test is used as a laboratory tool in development work, it should not be a serious handicap to the test as an indicator of protective value when correlation between salt spray and service behavior has been established.

Other things being equal it will be obvious that the greater the potential difference between the coating and basis metal, in the particular environment within the salt spray chamber, the greater will be the corrosive action at the site of the discontinuity. Conversely as the potentials of the two metals approach each other in this atmosphere the action will be less, and the test will cease to perform its function when the potential difference is reversed. When the potentials are the same only relatively large discontinuities, for example those approaching the dimensions of actual bare spots, will be revealed.

It will be apparent that the test is not particularly suited for comparing directly the relative porosity of different coating—basis metal combinations unless the potential relations are the same. It may serve a useful purpose, however, for comparing the relative porosities of the same combinations, other things being equal.

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When the potentials are reversed to a significant degree, as in the case of the electronegative coatings, the salt spray test may again be useful but in a different manner; that is, as a rough measure of the thickness or quantity of the coating applied. However, in view of the fact that quicker as well as more reliable methods for measuring the thickness of the common electronegative coatings are available<sup>3, 4</sup> the use of the salt spray test, primarily for this purpose, cannot be recommended. In the case of zinc coatings the relation between thickness of the coating and its salt spray life appears to be a straight-line function; however, this does not appear to be so in the case of cadmium deposits.<sup>5</sup> Here again the test is most reliable when the same coating—basis metal combinations are compared and may be misleading for comparing different combinations.

The salt spray test can also be used to check possible deleterious effects of coupling dissimilar metals and the effectiveness of electrodeposited coatings in minimizing such action. In this connection it should be emphasized that the potential relationship of the coupled metals may change, depending on the environment to which they are exposed, and also that in the salt spray test an abundance of a strong electrolyte is present to promote the galvanic action. Hence, here again correlation with actual exposure should be established before predictions based on salt spray test data are made.

With the establishment of suitable correlation with service conditions, the salt spray test may also be useful in judging the corrodibility of the coating itself. This factor in addition to the protection of the basis metal must be considered, for example, in the selection of suitable finishes for certain sensitive electrical and mechanical equipment. Correlation with service performance is particularly important in this connection, however, since the salt spray test provides continuous wetting of the surface while atmospheric exposure is generally intermittent. Hence, the formation of protective films may take rather different courses in the salt spray and in the atmosphere.

#### ***Limitations of the Salt Spray Test***

The salt spray test has been referred to in the above as though it were completely standardized and prescribed, as well as performed in the same manner by everyone concerned. Unfortunately this is far from true, and in spite of several attempts toward standardization,<sup>6, 7, 8, 9</sup> current methods of prescribing and conducting the test vary widely. For example, a recent inquiry conducted by the Society's Committee B-8 on Electrodeposited Metallic Coatings revealed the following current operating conditions:

Solutions and the concentrations being used range from natural and synthetic sea water to saturated sodium chloride. Temperatures of operation vary from uncontrolled "room temperature" to 150°F. In the majority of cases, however, either the former or 95°F. is employed, the distribution between these two being approximately equal. Air pressures employed to atomize the solution range from 8 to 80 psi with no particular effort in most instances regularly to control the fog density other than as "heavy." The sizes of the test chambers employed vary from a few cubic feet to the dimensions of a small room. The positions of the specimens within the test box vary from the horizontal to the vertical, and the exposure periods range from 1 to 500 hr., depending largely on the purpose of the

test, or the requirements of the particular specifications.

Variations such as noted above, particularly in respect to temperature and the position of the specimens, which unfortunately are possible variations even though the test is performed in accordance with A.S.T.M. Tentative Method B 117-41 T, can account for the observed lack of reproducibility of salt spray test results and in a large measure are responsible for some of its severest criticism. On several occasions it has been observed that vertically suspended test panels were not uniformly wetted even after 200 hr. exposure while exposed horizontal surfaces were wetted almost immediately. Obviously this is a source of considerable variability, particularly when short exposure periods are involved. In this connection the testing of production items of complicated shapes demands particular attention in that certain surfaces may never be wetted while others are more or less drenched. It will be apparent that such specimens should be so placed that their critical or significant surfaces are freely exposed to the action of the spray and in the interest of reproducibility the positions should be the same in all cases. Little information is available in the literature in regard to the effect of operating variables as applied to electrodeposited coatings, excepting temperature.

Another limitation, particularly in reference to the use of the test for judging the quality of electrodeposited coatings, is the qualitativeness of the results and in many cases the difficulty of defining a suitable end point. For example, if it has been established that for a coating to be satisfactory it shall completely protect the basis metal when exposed to the salt spray test for 200 hr., one could then require that there be no corrosion of the basis metal in the prescribed test within the prescribed period. This obviously means that in the case of electropositive finishes, the coating must in effect be completely continuous or nonporous and in the case of electronegative finishes, the coating must be of sufficient thickness to give cathodic protection to the basis metal for the prescribed time.

If on the other hand experience has shown that complete continuity of electropositive coatings is not required, which is known to be the case in many instances, the problem of describing a degree of corrosion which can be tolerated presents itself. This is one of the greatest weaknesses of the salt spray test for specification use. Shortening the period of exposure is by no means a solution to the problem because in the case of electropositive coatings the period for the first appearance of basis metal corrosion is primarily a function of the effective size rather than the number of pores. Thus a very useful coating with a single large pore may be rejected whereas a relatively inferior coating with a large number of very fine pores would be acceptable. In the A.S.T.M. Specifications A 166 and B 142 previously referred to, this limitation is circumvented with reasonable success by requiring that there be no appreciable corrosion within a specified time. Appreciable is then defined, for example, as the presence of more than six corrosion spots per square foot or any spots larger than 1/16 in. in diameter. Difficulties have occurred in interpreting this requirement as applied to small piece parts, for example, those of less than 24 sq. in. However, it would appear that this difficulty could be easily resolved and is only mentioned here for the sake of illustration.

Another limitation of the salt spray test results from the

lack of fundamental knowledge regarding the behavior of different coating—basis metal combinations under the conditions of the test, particularly in regard to the magnitude of the potential relationships between the two metals. In the use of the test for indicating resistance to corrosion, this factor of course becomes relatively unimportant when correlation between salt spray and service behavior is established. Its importance is great, however, when there is an attempt to predict service behavior from salt spray data in the absence of such correlation. It cannot be too strongly emphasized that the salt spray test merely shows the corrosion behavior of coatings and materials when exposed to the conditions which exist *within the test chamber*, and any correlation of this with service behavior can only be established with certainty by actual test of each combination. There is an apparent lack of such data, particularly in regard to the behavior of electrodeposited coatings intended for indoor use.

#### Factors to Be Considered in Regard to Specifications

One of the primary factors to be considered before any test is incorporated in a specification as a basis for acceptance or rejection is whether or not the test is capable of yielding reproducible results, especially when performed at different times and by different people. This is particularly true for accelerated corrosion tests of which the salt spray test is a notable example.

Having established the suitability of the test from the standpoint of its reproducibility, an equally important factor to be considered is whether or not the result obtained is a true measure of the factor it is intended to control. That is, for example, in regard to electrodeposited coatings, is there suitable correlation between the test results and service performance? Without such correlation, the test is useless. In this connection reasonably good correlation has been reported between salt spray and outdoor exposure tests of nickel coatings for varying thicknesses on steel.<sup>10, 11</sup> That is, increased corrosion protection is obtained in both cases by increasing the thickness (decreasing the porosity) of the coating. Correlation has not been satisfactory, however, when nickel and nickel plus chromium coatings of the same general thickness are compared.<sup>11, 12</sup>

When satisfactory correlation with service has been established and reproducibility of the test is accomplished, the maximum service requirements of the finish should be considered in relation to the cost and practicability of obtaining such a coating.

Among other things to be decided in this connection is the relative importance of *appearance* of the finished article, involving the corrosion resistance of the coating itself *versus* the corrosion protection of the basis metal, including the degree of protection required. The former of course involves the latter but the reverse is not always true. It will be apparent that decisions on the above factors should include consideration of the expected or desired length of life of the finished article and the environmental conditions to which it will be exposed. In this respect and particularly in cases where the parts to be finished are components of a more elaborate structure, due consideration should be given to apparatus or equipment of which the finished article forms a part.

An example of the apparent disregard of this factor is a certain restricted specification in widespread use which

required that ". . . the plating on all plated parts shall be" among other things "capable of withstanding . . . a period of 200 hr." in the salt spray test at 35°C. "without evidence of rust, corrosion or other deleterious manifestations." While this probably could be attained the need for such stringent requirements is questionable, in view of the type of equipment covered by the specification. It is probable that the literal interpretation of the requirement does not convey the real intent of the specification. If such is the case it also illustrates the need for definite knowledge regarding the minimum requirements acceptable and the necessity for care in defining the end point of the test.

#### Conclusions

1. The salt spray test cannot be recommended as a quality test for electronegative type coatings.
2. When thoroughly standardized and properly conducted the salt spray test is frequently useful in evaluating the degree of porosity of electrodeposited metallic coatings of the electropositive type.
3. The time of exposure to the salt spray required to reveal a certain degree of porosity varies with the coating—basis metal combination being tested and should be correlated with actual exposure tests.
4. The time required for "first rust" to appear is not as important as the appearance of the coating after a given length of time in the salt spray.
5. Further standardization of A.S.T.M. Tentative Method B 117-41 T in order to reduce the number of variations permissible seems advisable at this time. Also the individual user of the salt spray box must put forth a much more conscientious effort to standardize his equipment and his exposure technique.
6. The lack of experimental data correlating salt spray and service behavior of the wide variety of coating—basis metal combinations would indicate that except for revealing particularly inferior coatings the test does not merit its current extensive use in specifications.

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<sup>10</sup> Paul W. C. Strausser, Abner Brenner, and William Blum, "Accelerated Tests of Nickel and Chromium Plating on Steel," *Journal of Research, Nat. Bureau Standards*, Vol. 13, No. 4, 519 (October, 1934).

<sup>11</sup> C. E. Heussner, "Comparison of Salt Spray and Ocean Spray Testing," *Proceedings of Educational Sessions*, Am. Electroplaters' Soc., 75 (June 8-9, 1942).

<sup>12</sup> G. A. Lux, and M. Berdick, "Effect of Polishing Base Metals Upon the Protective Value of Electroplated Coatings," *Proceedings of Educational Sessions*, Am. Electroplaters' Soc., 19 (June 8-9, 1942).

**Editor's Note.**—The following remarks by Mr. Sample were made in presenting his paper at the meeting and include some supplementary data to the paper.

MR. C. H. SAMPLE.—I realize the salt spray test is a very controversial subject and I want to make it clear it is not my intention to be destructive in my criticism of it. Also, I have nothing new to contribute in the way of experimental results which might prove or disprove the value of the test. In this sense my remarks might be construed as not being very helpful and one might ask, then just why was the paper written. The answer to that question is essentially this. It appeared that the importance of the salt spray test for evaluating the suitability of electrodeposited coatings was being very much overemphasized. Furthermore, it appeared that in some instances this false importance had reached such proportions that it was impeding the design and manufacture of important equipment. For example, in several instances that have come to my attention, the specifications require that the plating on all plated parts shall be capable of withstanding 200-hr. exposure in the salt spray test "without evidence of rust, corrosion or other deleterious manifestations." I should like to emphasize that this requirement applies to all plated parts. It will be apparent that even the relatively insignificant components of the elaborate structures covered by this specification are included in this requirement. Also, this requirement applies to the finishes on relatively corrosion resistant materials, which would of themselves exhibit a satisfactory, useful life without any finish whatsoever. Again this requirement holds even though in some instances the equipment is housed within a waterproof gasketed enclosure.

Of course these criticisms cannot properly be directed at the salt spray test *per se*, but rather at the lack of sufficient consideration of all the factors involved, particularly in regard to the wording of the requirements in the specification.

On the other hand, it is generally agreed, the salt spray test can be a very useful tool for evaluating the suitability of certain electrodeposited coatings, when, of course, it is properly operated and controlled, and when the results are interpreted in the light of the limitations of the tests. In this paper I have attempted to point out (to a limited extent) what appeared to me to be proper uses and some limitations of the test together with pertinent facts which should be considered in using the test in specification. It is hoped the paper will promote the proper use of the test and at the same time curb the trend toward what appears to me to be misapplications. It is further hoped that the paper will stimulate some active research aimed toward determining the effect of operating variables on the results of the test, and the correlation of test results with service exposure. That there is need for work in this connection is borne out by the lack of experimental evidence in the literature. The

lack is noteworthy particularly in regard to indoor exposures, that is, indoor exposures of the type to which communication and other electrical equipment will be exposed. In regard to the apparent lack of experimental data I recently had the opportunity to review an extensive bibliography on salt spray testing. This bibliography covered articles published during the last 19 years. There were only 10 of these that dealt specifically with metallic coatings and only one of these was concerned with indoor type of exposures.

The principal conclusions drawn from the paper are as follows:

Since thickness measurements are a better measure of the protective value of electronegative coatings and since quick and reliable methods for measuring thickness are available, the salt spray test cannot be recommended as a quality test for such finishes.

On the other hand, when thoroughly standardized and properly conducted, the salt spray test is of value for revealing the quality of electropositive type metallic coatings.

Also, it is concluded that in the interest of reproducibility it would appear desirable to further standardize A.S.T.M. Tentative Method B 117—41 T in order to reduce the number of permissible variations.

And finally the lack of experimental data correlating salt spray and service behavior of the wide variety of the coating—basis metal combinations would indicate that, except for revealing particularly inferior coatings, the test does not merit its current extensive use in specifications.

## DISCUSSION

MR. SAM TOUR.<sup>1</sup>—As chairman of the Society's Committee B-3 on Corrosion of Non-Ferrous Metals and Alloys and as the Society's tentative method for the salt spray test is under the jurisdiction of Committee B-3, it seems that I should make some comment on this paper on the "Use and Misuse of the Salt Spray Test as Applied to Electrodeposited Metallic Finishes."

It is certainly true that there are numerous variables in the salt spray test. I question, however, whether it is desirable to so standardize a test that everything is tested in precisely the same manner at precisely the same temperature, with precisely the same solution, for the same number of hours and viewed with the same pair of eyes, and laid in the same position in the test. Service conditions are not that standard. It seems to me that any test should be designed in accord with the service intended for the part. If the part is a part of irregular shape and section, it is impossible to put it in a test box and have it in a horizontal or vertical position. It will be in all its characteristic positions according to the shape of the part. We should not test flat panels, and say that the result is applicable to a curvilinear surface. We should test the material itself and not some substitute for it made to suit some particular peculiar test conditions. The salt spray test set up by Committee B-3 permits the use of whatever material is to be tested in the test box without specifying that it must be flat, horizontal, vertical, or at some particular angle. The same is true with respect to the solution. Some prefer to determine corrosion resistance to sea water which is around 3 to 4 per cent salt while others prefer 20 per cent sodium chloride solution.

For direct marine exposure service, a test should be per-

mitted that uses marine water and not 20 per cent sodium chloride, and *vice versa*.

There has been a considerable amount of work done on the question of temperature. Mr. Heussner published a paper some years ago which showed the variation in rate of attack in salt spray at different temperatures. I doubt if it is necessary to specify that every laboratory use the same temperature. It may not be convenient to use the same temperature in the North as in the South and tropical zones. Ninety-five degrees may be satisfactory at some places—every now and then it does get hotter than 95°F. in some places, but I doubt if we should specify 140°F. either. If it is known that the test results vary with temperature, and account can be taken of temperature, why restrict the test? The test can be standardized and yet can be varied, controllably, to suit the particular material being tested.

It is true that there are specifications for materials which specify unreasonable requirements. It is possible to find specifications that call for a 200-hr. salt spray test on items that are never to be exposed to salt atmosphere. That is no fault of the salt spray test; it is an error on the part of the man who wrote the specifications.

There are many places where the requirements for material used in a machine are higher than what is really necessary. In these days when we are redesigning material to make use of less strategic metals we find many cases where the designer originally went down some list and picked out the gold-plated articles because they looked good. Often we can get along with much less expensive and what might be said to be a lower quality metal, yet of adequate quality for the service. Instead of complaining about the salt spray test *per se*, we should complain about the specifications which specify excessive salt spray test resistance.

There are some specifications with regard to finishes on steel which call for only 16-hr. salt spray resistance. That certainly is the other extreme for the 200-hr. test that is referred to in this paper. Resistance for 16-hr. in the ordinary salt spray box is very little resistance. If more corrosion protection than that is not required, it should not be necessary to go to the extremes in standardizing the salt spray box.

The paper contains the rather positive statement that the salt spray test is not applicable to such coatings as, for example, zinc on steel. It is true that we can measure the thickness of a zinc coating on steel. However, to measure the thickness in every spot over the entire surface is very difficult. If the salt spray test is a test which will pick out nonuniformity and do it more quickly or more efficiently than a thickness measuring gauge, then certainly the salt spray test is the test to use. That is the way the salt spray test is being used on quite a number of zinc-plated articles. Although theoretically the salt spray test may not be applicable where we have sacrificial metal coatings, practically it is a useful tool.

MR. F. L. LAQUE.<sup>2</sup>—I find myself in rather serious disagreement with Mr. Tour's remarks questioning the wisdom of standardizing the conditions under which the salt spray test should be conducted. I gathered that Mr. Tour considered the possibility of so conducting a test in a salt spray box as to reproduce some condition likely to be encountered in the practical use of the materials in which

we are interested. I am inclined to doubt that there are many cases where we are interested in the performance of materials under the exact conditions that ordinarily exist within a salt spray box. I am pretty firmly convinced that there would be only a coincidental relationship between performance in the salt spray box and performance in the ocean, which I think would dispense with the requirement that sea water be used instead of sodium chloride or that 4 per cent sodium chloride be used instead of 20 per cent. I am also firmly convinced that the salt spray test is purely an arbitrary test and if it is an arbitrary test, why not make it arbitrary in a uniform and standard way?

MR. C. E. HEUSSNER.<sup>3</sup>—I should like to go along with Mr. Tour's suggestion that we cannot standardize the salt spray test for all production applications. The salt spray test should be standardized as a control tool based upon comparative test data. We use the salt spray test in checking for porosity of metallic electrodeposits of nickel. This test helps us to determine shop procedure, base metal cleaning, and pores in the deposit. Since these are production parts, it would be impossible to determine the angle at which the part is tested. On coatings such as cadmium and zinc, we use the salt spray as a continuity test to tell us whether we have complete coverage of the base metal. The lack of this coverage is usually due to poor cleaning, and not entire removal of scale, and this is readily detected by the salt spray.

The remark is made that many articles are not used at sea, so why use the salt spray? It should be remembered, however, that a great volume of electroplated articles are used at the seashore and seawater corrosion is severe. So on such applications, it might be well to substitute sea water for the 20 per cent salt solution and in some cases elevate the temperature of operation. These things again should be very carefully checked with controls. It is our belief that the salt spray is a very beneficial tool in segregating a great portion of the inferior quality of electrodeposited coatings—meaning by this, all parts that show corrosion in the salt spray are unsatisfactory when used but not necessarily meaning that all parts that are satisfactory in the salt spray will be quality deposits.

MR. E. A. ANDERSON.<sup>4</sup>—There is one phase of this general subject of salt spray testing which I think is worth emphasizing, as a word of caution.

Mr. Sample has pointed out that in his search for information, for positive published data, he has found very little. There is a real need for adequate data on which to settle many of these controversial opinions. I will say that in preface to the point that I wish to make.

If we assume, and it can only be an assumption until proof is obtained, that the order in which samples of the same type—to distinguish from comparisons between different types—fall as to quality in a salt spray test will be the same order in which they fall in service, we may find ourselves sadly misled.

(Concluded on page 782)

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# The Application of Scientific Management in the Plating Room

By JOSEPH HAAS

*Industrial Engineer*

In the August issue of *Metal Finishing*, there was presented the problem confronting Management in connection with the choice of a finishing foreman as outlined by Mr. Faulhaber. In the following article, Mr. Haas discusses the necessity for close cooperation between Management and the Foreman in order to obtain efficient operation of the department.

The author has been a frequent contributor to our pages in past years. In his present position as Factory Superintendent of the Brooklyn plant of the National Silver Company and previously as Foreman Plater, Assistant Factory Superintendent, Factory Manager and Consulting Engineer for many large plants, he has had the opportunity to study at first hand all the aspects of the important relationship between the front office and the factory. His statements may therefore be accepted as carrying the mark of authority.—The Editors.

WHEN in 1909 the American Electroplaters' Society was organized, the plater through Branch meetings entered the fraternal stage wherein he obtained the solution of his various problems by associating with his fellow workers. Later through various universities and the Electro-Chemical Society, he recognized that plating was more than a series of pet and secret formulas which yielded results under his skillful manipulations, and that real science and technical knowledge were the background of his daily work.

With the advent of the U. S. Bureau of Standards' interest in the electrodeposition of metals, and their readiness to give an assisting hand, the plater, and the manufacturer also, realized that a certain knowledge had to be acquired to overcome the hit and miss methods of plating practices. The result was a scramble to obtain a chemical knowledge and background.

In the development of the plating industry to its present status, we must not forget to mention the manufacturers of plating equipment and chemical and lacquer supply companies. Through the engineering and research laboratories of these companies, new developments were passed on to the electroplating industry.

There is no doubt that today we find the electroplater less worried insofar as chemical knowledge and practical appli-

cation are concerned. Either he is in a position to control his solution by chemical analysis, or his employer has hired a chemist for him. Thus he has been able to maintain more uniform operating conditions.

But, the electroplating department is today, notwithstanding the above mentioned progress, the least appreciated of all departments in a manufacturing establishment. In most plants, the electroplating department is considered a necessary evil, rather than an asset. Why? Because it is claimed that the electroplater has been the least cooperative of all departmental heads. While the plater was getting his chemical knowledge, other departmental heads were going through readjustments of what is known as *Scientific Management*.

An attempt to apply the same principles to increase production, improve quality and reduce costs that were successful in the other departments of a manufacturing plant have met and today still meet opposition from the plater.

Making solutions, keeping them operating with or without chemical control is not what the plater is hired for. He is hired to produce work, at a price to meet competition. Therefore, to gain the recognition that he desires, the plater must look and act further. He must become a Manager through the application of simple, common sense principles that have been given the name of *Scientific Management*. And he is well capable of initiating and applying these principles if he places himself in the proper mental attitude.

About the time that the plater started to be interested in the chemistry of electroplating, the manufacturer came to the realization that men in executive positions as well as individual operators had little knowledge of how best to perform operations, and what conditions and circumstances were best suited to the execution of any particular operation. Business men were amazed at the amount of work that was performed by guess work or past practice without any sound reason for it being done in that manner. In addition, they were astonished at the amount of waste, spoiled work, and unscientific methods with which operations were performed.

They realized the necessity of ascertaining the best method of performing the job. And they proceeded to correct these failings.

It is entirely possible that the interest of the electroplater in the science behind his work may have been tied in with this movement.

Every business or part of a business such as electroplating has for its purpose to make something and sell it for more than it costs, the difference between the cost and the selling price being the profit. However, increased competition in all business has cut the margin of profit. One of the first to recognize the necessity of detailed and intimate study of "how to work" was F. W. Taylor. Taylor laid down the laws of Scientific Management, which have been interpreted in various ways by many of his associates.

### **What Is Scientific Management?**

Scientific Management is a method of governing or operating a business or a department in accordance with known information available to all, instead of relying upon rule of thumb methods, individual opinions, or decisions made according to personal prejudices.

Methods of performing work are carefully analyzed to eliminate useless efforts and make every movement count. When a better method is evolved it is utilized.

Scientific Management separates the mental work—or the knowledge and practical experience related to any particular occupation—from the actual performance of the labor, and takes the former entirely out of the hands of the workman.

Therefore, our first law requires that means be provided for utilizing all of the available knowledge concerning the work in hand.

To meet the requirements of this law every plating room should have:

1. Process charts showing the sequence of plating operations prominently posted, or in the hands of the operators.
2. Tables showing racking or wiring data of parts to be plated.
3. Load charts posted at the plating tanks showing the amount of the various racks per tank load.
4. Tables available showing current conditions and time cycles for the various loads.
5. Cards or charts available describing all plating processes, finishes, etc.,—stating definitely the surface condition or last previous operation before plating operations.
6. Tables showing square foot area of the various articles to be plated.
7. Tables showing plating thicknesses per square foot at various current densities for different time elements.
8. Production record kept at each production center or unit.

### **Hiring and Training Help**

The next law in the proper management of a plating department deals with the selection of the operating help. Today, due to labor conditions and various other obligations placed on manufacturers, the hiring of help is seldom done by the plater. More often the help is hired by a Personnel Manager, who is specially informed as to the many laws pertaining to and governing labor, and who is given more details as to the manufacturer's labor policies.

This does not necessarily mean that the plater always receives the best help.

The hiring of proper operators is of the utmost importance. Efficiency places particular stress upon human ability and effort, and one of the most difficult problems confronting the plater is to obtain operators sufficiently intelligent and interested to perform their tasks as instructed and directed. Otherwise, they should have no place in a plating room.

Having selected the proper help for the plating room, the third law requires that they be properly trained and developed.

The usual method of introducing a worker to his tasks in a plating room is to either turn him over to some older employee to break in, or have the foreman show him what to do with little or no explanation.

To properly introduce an employee to work in the plating department, he should be given an instruction card describing his duties. To each employee, be he racker, dipper, or plater, there should be given a written description of his work and responsibilities together with a general list of precautions.

Just how far this training and development will go is entirely dependent on the conditions of the job. The job may require the performance of a series of operations. On the other hand, it may be better broken down into two or even three steps.

The training and development of the worker should also include the issuing of proper instructions daily, seeing that they are thoroughly understood, and unquestionably followed.

Telling or teaching the operator how to work is one of the main functions of a foreman. Plating is interesting work and the plater who gives an explanation to an operator has taken a worry off his mind, because in doing so his operators will be encouraged to come to him, when they are in any difficulty, instead of trying to wiggle out of it themselves without asking for assistance.

Requiring that instructions be unquestionably followed does not mean that operators should not be encouraged to make suggestions. It means that instructions be followed as to methods of performing the work, and that operators do not try out any ideas of their own without obtaining approval.

### **Wage Payment Plans**

The fourth law requires that a satisfactory payment of wages be established based on quantity and quality. This involves an analysis of each type of plating job to determine the proper time for accomplishment, and it means that the highest payment is received for the more skillful or exacting requirements and the attainment of the standards.

When a satisfactory wage payment is mentioned or taken under consideration, it means other than a flat hourly or weekly rate, because experience has proven that these do not bring out the best efforts of the worker, nor do they encourage the more ambitious. A satisfactory wage payment plan starts off with measuring human effort and accomplishment and then places an incentive to maintain that effort and accomplishment.

There are but two methods of wage incentive plans, namely, individual and group. Individual payments are applied to operations that are self-contained, or those in which the operator performing them is dependent upon no one but himself. Group payments are made or applied when a major operation is dependent upon a series of minor operations involving more than one operator.

While many types of wage incentive plans have been tried out, the trend has been to narrow down to one of two types. One is based on a flat money rate per unit of production, and the other on standard production per hour, based on fixed rates per hour. For many reasons, management favors the latter.

The installation of a wage payment plan in a plating room most generally brings out the necessity of many changes among which are:

1. Re-arranging the layout of the plating tanks.
2. Changing the cycles and sequence of handling, cleaning and plating operations.
3. Re-designing of plating racks to handle the required production.

The advantages of a wage payment plan are:

1. It relieves the foreman of seeing that operators work and do not loaf. He thus has more time to plan and lay out the jobs that the production department needs.
2. It keeps plating costs uniform because any decrease in available volume becomes immediately apparent and the foreman can take steps to reduce his working force.

Thus have been outlined the four principles or laws of Scientific Management, the adoption, application, and functioning of which manufacturers contend have not caused

their plating rooms to progress to quite the same extent as the other departments of the factory.

For this reason, management states that the scheduling of parts through a plating room is erratic and that parts are not received when they are wanted. This brings forth the statement that the plater with all his chemical knowledge has organized the details of his daily work so poorly that he is compelled to spend too much time checking his operators and operations and that he does not have time to plan his work and to fully cooperate with the rest of the factory.

At meetings among platers, the topics most frequently raised for discussion pertain entirely to plating solutions and difficulties encountered in their operation. Seldom are the problems pertaining to production, quality, and costs brought up. The idea seems to exist that if the solutions are working right, these other factors will take care of themselves. Many examples that such is not the case could be given, but one will be sufficient.

There was published in a past issue of *Metal Industry* a survey of a plating room study, wherein production records showed that 150 gross per day could be produced by six men when sufficient work was ahead of the department. But when the amount of available work was low, as little as 80 gross would be turned out by the same six men.

Although one instance of the successful solution of a problem helps more than a dozen theories, this paper by necessity had to be confined to merely outlining a desirable development and improvement in plating departments.

Scientific Management cannot be put on like a suit of clothes. To be introduced successfully, all surrounding conditions must be favorable. Also, it is not without limitations; but where there is a willingness to give it a break, permanent advantages can be gained from it by management, the foremen, and labor.

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## Use and Misuse of the Salt Spray Test as Applied to Electrodeposited Metallic Finishes

(Concluded from page 779)

I brought with me some old data obtained at a time when no attempt was made to standardize salt spray tests, so we cannot place too much reliance on them, but the figures fall something like this:

On three lots of plated materials, all of the same thickness range, the lives on an outdoor exposure to the first appearance of the first corrosion blisters were 12 months, 12 months, and 1 month. The hours of salt spray from companion samples of the same lots were 112 hr., 104 hr., and 111 hr.

Now in that particular case if the salt spray test had been the criterion for acceptance on production, lot No. 3, which had only one-twelfth of the service life of lots No. 1 and 2, would have been accepted.

I am not offering that as an objection to the salt spray test but as a warning that there is a real need for correlation studies between service and salt spray to avoid the possibility that we may be misleading ourselves in believing that high salt spray values necessarily mean good

service life. There may be possibilities of reversals.

MR. SAMPLE (*author's closure*).—In closing I would like to thank the discussers for their remarks. Also I can say that in general I concur with most of the comments made.

In regard to standardization of the test I agree with Mr. Tour to the extent that it is impracticable in a general specification to specify the particular angle at which the variety of production items should be placed in the salt spray box. However, it seems practicable and desirable to me that any particular item being manufactured and tested by different suppliers be tested in a uniformly standard manner by everyone concerned.

In addition to the use of the test for evaluating the finishes on production items, it should be emphasized it is also widely used as a laboratory research tool in the development of protective coatings. In the latter use complete standardization would appear particularly desirable in the interest of reproducibility.

# THIS IS WASHINGTON-

By George W. Grupp  
METAL FINISHING's Washington Correspondent



## Definite Policy Needed

This whole problem calls for a definite policy on what constitutes war business subject to termination and the rights of claims against the Government on contracts. The Congress should pass legislation providing that all Government departments and agencies must use a uniform clause. The Congress should incorporate in this measure provisions for uniform war contract accounting methods, regulations, and termination procedure and notices. The Congress should enact legislation on the handling, disposition, and safeguarding of inventories and property involved in the war effort. And the measure should provide protection to subcontractors against possible losses due to the insolvency of prime contractors.

## Contract Termination Bills Before Congress

At the present time there are several bills before the Congress which have not been reported out of the committees because of the hearings which are being, and will be, held by the Senate and House. Senate 1268 is a bill to facilitate the termination of war contracts by any department or agency, to make advances or partial payments, to make loans or guarantees, and to purchase certain interests of prime contractors, subcontractors and suppliers. Senate 1280 is a bill to provide authority to the Secretary of War to use funds now or hereafter appropriated for the adjustment of contracts. House 3022 is a bill which authorizes the Secretary of War to use any appropriation in connection with the termination of War Department contracts under regulations fixed by the Secretary of War.

## Termination Accounting Manual

It might be a good plan for metal finishers to acquaint themselves with the War Department's Procurement Regulation Number 15 which is entitled "Termination of Contracts for the Convenience of the Government for Use of Contracting Officers." This regulation may be obtained from a local office of any contracting officer. "The War Department Termination Accounting Manual for Fixed Prices Supply Contracts" can be obtained from the Superintendent of Documents, Government Printing Office, Washington, D. C., at 25 cents each.

## Dr. Meyer Addresses Baltimore- Washington Platers

The November meeting of the Baltimore-Washington Branch of the AES was graced with a large attendance which turned out to hear

Dr. Walter R. Meyer, Technical Director of The Enthone Company, deliver himself of an

interesting and informative talk on "Blackening of Ferrous and Non-Ferrous Metals". This talk was followed by a lively discussion between Drs. Meyer, Blum, Brenner and Lamb, and others present. In this presentation talk, Dr. Meyer dealt with the methods of preparation of metals for blackening; the uses of tanks heated with gas, electricity, steam and oil; the dangers of adding water to hot solutions; the preferable solution temperatures to obtain the desired thickness of black coating on each kind of metal, and the advantages and disadvantages of blackening such metals as aluminum, brass, copper, cadmium, nickel, silver, zinc, and iron. He touched lightly on how steel is blackened by heat, by immersion in fused nitrates, and by caustic soda oxidizing solutions which he said were essentially ferro-ferric oxide. Dr. Meyer expressed the opinion that cast iron is difficult to blacken. In his discourse he described three methods of blackening zinc and two methods of blackening silver. He said that black nickel is not a satisfactory coating. In discussing cadmium blackening methods, he advocated a zinc coating on cadmium before blackening. In outline he described four methods of blackening brass. The blackening of copper by the commonly used potassium sulfide method, he said, was not satisfactory because it speeded up corrosion and developed crystal spots. The immersion method, he said, was the preferable process in blackening aluminum.

## Budget Bureau Questionnaire Protests Registered

Some businessmen have written to Washington to register their protest against the asking of some questions in Budget Bureau Questionnaire 49-R112 because some of the 145 questions asked in this report, which requires a tremendous amount of work for accountants, have no bearing on the renegotiation problem for which the questionnaire was prepared. They particularly object to some of the questions in Section R, page 5, of this questionnaire. Here are three of the questions asked under this Section. "Question No. 126: Brief description of important plants, including locations, type of construction, square feet of floor space, products manufactured, per cent of output on war business. Also for the entire company, give average number of employees now and in peace time. Question No. 127: List of major customers and approximate dollar value of products purchased from company during the latest closed fiscal period. Question No. 132: Significant contracts or orders received on competitive-bidding basis, extent of competition, and how company's low costs and efficient operation offset territorial and freight differentials. Comparison of important high and low cost producers in the same line." How many metal finishing firms would be able to

supply all the information asked for in Question No. 132 without the aid of a research specialist?

**Aluminum Reporting Reduced**

unfilled orders, and production for aluminum controlled materials (except ingot) on Form WPB-2685 (formerly CMP-24) is curtailed for any company whose shipments amount to less than 2,000 pounds in a month." Such companies are now only required to notify the Aluminum and Magnesium Division of the WPB that their shipments were less than 2,000 pounds.

**Aluminum and Copper Allotments on a Yearly Basis**

copper and aluminum to small manufacturers will be handled on an annual basis instead of on a quarterly basis for the purpose of reducing the amount of paper work. They claim that out of the approximately 55,000 applications which pour into Washington each quarter for controlled materials for "B" products (CMP-4B) about 37,500 will be eliminated by handling the applications of 15,000 small manufacturers on this long term basis.

**Aluminum Restrictions Eased**

for the purpose of expanding the uses of aluminum. This amended order permits the use of aluminum for data and instruction plates not exceeding 0.035 inch in thickness, electric bus bars, bare electrical conductors and current-carrying accessories for conductors, and cooling fans for electric motors. It also permits aluminum ingot to be added to galvanizing baths.

**Belgian Congo Tin Production Increasing**

compared with 14,000 tons in 1939. In 1944 it expects to produce 31,000 tons, and in 1945 it expects to increase its production to 35,000 tons.

**Carrier Contract Adjustments**

and other customers when applying, or about to apply, to the Office of Price Administration for adjustments in their maximum prices according to Amendment No. 13, Supplementary Regulation No. 15 to the General Maximum Price Regulation, issued on November 3, 1943.

**Controlled Materials Announcement**

materials producers from accepting other than (1) authorized controlled materials orders, (2) sample orders, or (3) orders which they are specifically directed to accept by the War Production Board, do not prevent such producers from

For the purpose of reducing paper work, the War Production Board announced on November 3, 1943, that "the reporting of shipments,

unfilled orders, and production for aluminum controlled materials (except ingot) on Form WPB-2685 (formerly CMP-24) is curtailed for any company whose shipments amount to less than 2,000 pounds in a month." Such companies are now only required to notify the Aluminum and Magnesium Division of the WPB that their shipments were less than 2,000 pounds.

Program Vice Chairman J. A. Krug and Operations Vice Chairman H. G. Batcheller of the War Production Board announced on October 25, 1943, that the allotments of steel,

copper and aluminum to small manufacturers will be handled on an annual basis instead of on a quarterly basis for the purpose of reducing the amount of paper work. They claim that out of the approximately 55,000 applications which pour into Washington each quarter for controlled materials for "B" products (CMP-4B) about 37,500 will be eliminated by handling the applications of 15,000 small manufacturers on this long term basis.

Because of the increasing supply of aluminum, the War Production Board issued Supplementary Order M-1-i as amended October 29, 1943,

for the purpose of expanding the uses of aluminum. This amended order permits the use of aluminum for data and instruction plates not exceeding 0.035 inch in thickness, electric bus bars, bare electrical conductors and current-carrying accessories for conductors, and cooling fans for electric motors. It also permits aluminum ingot to be added to galvanizing baths.

Belgian Congo, which is the sixth ranking tin producing country in the world, is expected to produce 20,000 tons of tin in 1943, as com-

pared with 14,000 tons in 1939. In 1944 it expects to produce 31,000 tons, and in 1945 it expects to increase its production to 35,000 tons.

Carriers, other than common carriers, may enter into adjustable pricing contracts with metal finishing

and other customers when applying, or about to apply, to the Office of Price Administration for adjustments in their maximum prices according to Amendment No. 13, Supplementary Regulation No. 15 to the General Maximum Price Regulation, issued on November 3, 1943.

The War Production Board announced on November 13, 1943, that "provisions of CMP Regulation No.

1, which prohibit controlled materials producers from accepting other than (1) authorized controlled materials orders, (2) sample orders, or (3) orders which they are specifically directed to accept by the War Production Board, do not prevent such producers from

accepting pieces of paper upon which purchase orders are written, although the orders are not authorized."

**Copper Scrap Reports**

as amended on October 25, 1943, which provides that generators of 5,000 pounds or more of copper scrap per month should now report on Form WPB 452. Prior to this amendment, those producing as little as 500 pounds had to file reports.

**Durable Flatware Production Restrictions Eased**

Limitation Order 1-140, which controls the production of all cutlery, was revoked on November 6, 1943, since it has been superseded by Order L-140-a on August 23, 1943, and by Order L-140-b issued on November 8, 1943. Order L-140-b grants permission for the production of durable flatware for restaurants, institutions, and home use for essential eating utensils. Outlined in detail in Table A, the order gives the specifications which must be followed. It provides for a small amount of nickel for plating under silver or chromium which it is believed will produce a heavier and more durable grade of flatware. Only two patterns may be made of four essential articles of flatware—knives, medium sized forks (generally known as dessert forks), teaspoons, and dessert spoons. The order also provides that beginning January 1, 1944, the production of flatware, including that produced for preferred orders will be on a quarterly quota basis. These production quotas will be assigned to each manufacturer in accordance with predetermined program requirements. The quota assignments will be tempered by availability of facilities and manpower. The new order prohibits the manufacture of hollowware, except for preferred orders, from metals other than gold, silver, and sterling unless the metal was put into process prior to November 5, 1943.

**Health Program Booklets**

The Office of Community War Services, Division of Recreation, of the Federal Security Agency recently issued a booklet on "Spare Time—A War Asset for War Workers"; and the Office of Education of the Federal Security Agency issued an illustrated booklet on "Physical Fitness Through Health Education for the Victory Corps". Both of these booklets aim to improve the health of war workers and high school students. The one which deals with the problem of spare time of workers may be had free of charge from the Regional Recreation Representative of the Division of Recreation of the Federal Security Agency. The other may be obtained from the Superintendent of Documents, Washington, D. C., for 25 cents.

**Inventory Regulations Eased**

Limitation Order L-63, which was amended on November 12, 1943, provides that suppliers who were required to keep inventory records under this order are no longer required to file form WPB-825 (formerly PD-336). The suppliers must, however, keep records of their total net monthly sales from stock and of their total inventory of supplies at the end of each month. This order, which was originally issued on July 1, 1943, for the purpose of restricting inventories of supplies held by wholesalers, jobbers, dealers, retailers, and branch warehouses, was also amended to clarify the meaning of the fourth exemption by substituting the phrase "replacement parts specially designed to fit only one model and brand of machinery or equipment and adaptable to no other use" for the phrase "functional replacement parts of machinery and equipment".

**Lubrication  
Equipment  
Plating  
Restricted**

General Limitation Order L-314 is issued by WPB on October 21, 1943, restricts the production of lubrication equipment and the use of certain critical materials. Unless the materials are specifically permitted under Schedules A, B, C, D, and E, the order prohibits the use of aluminum, cadmium, chromium, bismuth, tin, copper, zinc and nickel or their alloys in parts, finishes or plating. The order prohibits the polishing or buffing of the surface of any part except when essential for fitting or sealing or when it is necessary for and followed by plating.

**Nickel Chemicals  
Required Reports  
Reduced**

Directive No. 1 to General Preference Order M-6-a issued on November 1, 1943, by the WPB. Instead, such consumers should file end-use and preference rating information with orders to their suppliers. Only suppliers will be required to report such deliveries.

**Non-Ferrous Metal  
Inventories**

Part 12 of Report No. 10 of the Senate Investigation of the National Defense Program, which was released during November, 1943, reveals that according to the War Production Board, the United States had inventories as of June 30, 1943, of 405,481,869 pounds of aluminum, 575,253,087 pounds of copper, 13,551,157 pounds of nickel, and 235,961,394 pounds of zinc.

**Non-Ferrous Metals  
Being Substituted**

The United States Maritime Commission announced on November 15, 1943, that more than 30,268,828 pounds of brass and copper will be saved in the construction of the Victory fleet by substituting steel and iron. For example, fabricated steel portholes will save 9,568,400 pounds of brass a year. The exhaust pipes of the main engines to the condensers are now being made of steel instead of copper to save about 4,400,000 pounds of copper a year. Nickel plated brass plumbing fixtures are now being substituted by galvanized or painted malleable iron or carbon steel. Steel bells beginning to replace brass ship bells. Plywood is being used instead of brass in binnacles, and the use of cast aluminum, brass and bronze are being eliminated wherever possible in the making of electrical lighting fittings.

**Price Armistice  
Desired**

It should be of interest to the metal finishing industry to know that there is some talk in certain Washington circles that the Price Adjustment Boards are not giving enough attention to evaluating costs and prices on an industry-wide basis. They feel that a saving of men and materials on standard commercial products would result if there were an administrative armistice between the Office of Price Administration and the Price Adjustment Boards of the Army, Maritime Commission, Navy, and Treasury. It is their contention that the Office of Price Administration should declare nation-wide price ceilings for all standard commercial products premised on fair costs and profits, and that the Price Adjustment Boards should adopt a policy that all standard commercial products, not military items, fixed by the Office of Price Administration should be exempt from threats of retroactive price fixing and renegotiation by Price Adjustment Boards. They are of the opinion that the objectives of the Price Adjustment Boards, on the control of military items, should be (1) maximum production to get military items to the battle fronts with despatch regardless of cost, (2) control of costs and prices after manufacturers have gained real experience, and (3) recapture of profits where the preliminary

estimates were too high. On the other hand, they believe that the objectives of price control by the Office of Price Administration should be (1) to prevent inflation, and (2) to establish prices which give proper evaluation to costs and profits. This school of thought suggests that the office of Price Administration should have exclusive control over standard civilian commercial products, and that the Price Adjustment Boards should have control only over military items since overlapping authority is confusing.

**Silver Regulations  
Amended**

Silver Conservation Order M-199 was amended on November 11, 1943, for the purpose of including under the term "manufacturer" "any person who furnishes silver to a manufacturer under toll agreement to be processed and returned in semi-processed or finished form". This is an important change in connection with the computation of quotas for List B uses and with the proper charging of quotas.

**Sodium Metasilicate  
Under Allocation  
Control**

Due to the heavy increase of detergent requirements, sodium metasilicate, used chiefly in the manufacturing of cleaning and degreasing compounds, was placed under allocation by the issuance of Allocation Order M-355 on November 1, 1943. Beginning December 1, 1943, no primary supplier is permitted to deliver sodium metasilicate without authorization from WPB. The order applies to sodium metasilicate in both anhydrous and hydrated forms. Deliveries to customers ordering 800 pounds or less per month may be filled without reference to end-uses from a lump sum allocated for small orders. Deliveries of orders between 800 and 8,000 pounds per month will be authorized on the end-use basis as stated in the customer's application. Individual customer authorization must first be obtained for orders in excess of 8,000 pounds per month.

**Tin Content  
of Solders  
Increased**

General Preference Order M-43, as amended November 3, 1943, has relaxed restrictions on the tin content of solders where it has been found that a higher tin content is necessary. In some cases, under this amended order, the tin content permitted has been increased 21 per cent.

**Tin Plate  
Restrictions  
Clarified**

Supplementary Order M-21-e, as amended November 9, 1943, clarified the restrictions on terne plate, tin mill black plate, and tin plate. Tin or terne plate, coated with less tin than specified in Schedule A for any permitted use, is specifically allowed in the amended order. The provision restricting the use of tin to the quarterly quota assigned by WPB is removed.

**Tin Production  
in Bolivia**

It has been estimated that the 1943 production of tin in Bolivia for 1943 will amount to 38,383 metric tons as compared with 38,905 metric tons in 1942, and with 42,740 metric tons in 1941.

**Zinc Plating on  
Plumbing Fixtures  
Permitted**

Zinc Conservation Order M-11-b, as amended November 11, 1943, provides that the restrictions in paragraphs (a) and (b) of the order do not apply to the use of zinc or zinc products "for applying a protective coating or plating of zinc on plumbing fixture fittings and trim," for the making of "data, instruction and identification plates," and for the making of portable electric, pneumatic and power drive tools.

# SHOP PROBLEMS

PLATING AND FINISHING  
POLISHING — BUFFING  
CLEANING — PICKLING  
HOT DIP FINISHES

METAL FINISHING publishes, each month, a portion of the inquiries answered as a service to subscribers. If any reader disagrees with the answers or knows of better or more information on the problem discussed, the information will be gratefully received and the sender's name will be kept confidential, if desired.

## Bright Nickel Plating Patent Compendium

*Question:* Can you give us a patent record on bright nickel plating?—B. L.

*Answer:* We are pleased to list herewith such references:

*Hanson-Van-Winkle-Munning Co.; Weisberg & Greenwald, U. S. Pat. No. 2,026,718 (1936).*

*Harshaw Chemical Co.; Pine & Harshaw; U. S. Pat. No. 2,029,386-7 (1936) and U. S. Pat. No. 2,125,229 (1938). Lind, Harshaw & Long, U. S. Pat. No. 2,198,267-8 (1940); U. S. Pat. No. 2,238,861 (1941); U. S. Pat. No. 2,290,342 (1942); U. S. Pat. No. 2,291,590 (1942); U. S. Pat. No. 2,294,311 (1942).*

*McGean Chemical Co.; Waite, U. S. Pat. No. 2,114,006 (1938).*

*Pyrene Manufacturing Co.; Schlotter, U. S. Pat. No. 1,972,693 (1934).*

*Seymour Manufacturing Co.; Freed, U. S. Pat. No. 2,228,991 (1941).*

*The Udylite Corp.; Brown, U. S. Pat. No. 191,814 (1940); U. S. Pat. No. 2,211,535 (1940).*

## Spot Plating

*Question:* Recently we have had considerable demand from the trade for spot plating on our flatware—teaspoons, dessert spoons and forks. We have never done any spot plating and are wondering if you could advise whom we might be able to contact for information as to where we could secure equipment for spot plating flatware.

—B. M. Co.

*Answer:* We regret to advise that there is no standard equipment for this purpose, all of it being designed and made on the premises.

The usual procedure is to make a special rack on which the flatware is placed with the bowls and heels down. The rack is suspended so that only the parts to be spot plated are immersed in the silver solution.

A refinement of the process is to place pipes with perforations at intervals corresponding to the positions of the spots to be plated about one inch below the level of the solution. The silver solution is then pumped through the pipes and upon leaving the perforations produces bumps or elevations in the surface of the solution. This results in improved agitation and faster plating of the spots.

## Salt Spray Specifications

*Question:* In your November, 1942 issue you wrote an editorial about salt spray specifications. This was some time ago and salt spray specifications are still being used.

As long as salt spray specifications are still being written, we would appreciate knowing whether there is any relationship between the thickness of the finish, such as zinc and cadmium, and the length of the salt spray test. If there is any chart showing this relationship we would appreciate learning where it is available.—The W. Co.

*Answer:* There is no definite relationship between the thickness of cadmium and zinc and their length of life in the salt spray test because the resistance is dependent on the shape of the piece and the position in which it is hung in the salt spray chamber. This is the important relationship of the salt spray test.

However, for your information, we would advise that Army-Navy-Aeronautical Specification AN-P-32, Amendment 1 (November, 1942), expects that 0.0005" of zinc plating will withstand 100 hours salt spray and Specification AN-QQ-P-421a (June, 1941) requires that cadmium plating 0.0005" thick shall withstand 250 hours and 0.0002" thick shall withstand 100 hours.

## Silver Plating White Metal

*Question:* I am doing silver plating and would like you to give me all the available data on such work. Most of the metal is white or Britannia metal.—E. P. Wks.

*Answer:* The important thing to watch in plating white metal is not to over-clean the article as this may produce a film which does not permit good adhesion of the deposit.

The usual practice is to clean the polished article with a solvent such as trichlorethylene, carbon tetrachloride or Safety Solvent, after which it is dried and given a quick alkaline cleaning with direct current using a cleaner especially compounded for this metal. Such a cleaner is obtainable from any of the cleaner houses whose advertisements you will find in current issues of *Metal Finishing*.

The article is then rinsed, given a light acid dip in hydrochloric acid, rinsed again, given a cyanide dip to neutralize any acid remaining on the surface, after which it is treated in the silver strike and then silver plated.

## Control of Chromic Acid Solution

*Question:* We are doing a considerable amount of hard chromium plating on chromaly steel, the plating surface of which is two inches by  $\frac{1}{4}$  inch diameter and has an overall length of three inches. We have a separate 300 ampere generator for this work. Is there a formula for the size and form of a tank in which, for example, 24 pieces are to be plated at the same time? As we understand it, the formation of excess trivalent chromium is the result of the mis-proportion of plated surface to anode surface. In order to build up a deposit of hard chromium to 0.015 of an inch, we have had to continuously plate the article for a period from eight to 20 hours and while we do get a good deposit, we seldom get the same result for two identical plating times.

We start with a 33 ounce per gallon solution at room temperature and get a perfect first plating. For the second plating we add chromic acid to restore the solution to its original strength but the plating takes a longer time, perhaps because by this stage the solution is fairly hot. By the fourth or fifth time, even though we keep adding chromic acid, the depositing is almost ended and we have to make a new solution.—S. P. Co.

*Answer:* We should imagine that most of your trouble is due to improper control of the solution since you state that after the first plating, you add chromic acid to restore the solution to its original strength but do not say anything about adding sulfate to maintain your sulfate ratio.

It is important that the relation of chromic acid to sulfate be closely controlled in order to get consistent results. We suggest that you have your plating solution analyzed regularly for chromic acid and sulfate content. For satisfactory deposits, it is advisable to operate the solution at a controlled temperature of 130-140°F. This may require the use of a duplex controller for steam and cold water or a separate cooling coil. The current density must also be controlled. For proper operating conditions, we suggest that you refer to pages 12 and 13 of the 1943 edition of the *Plating and Finishing Guidebook*.

## Hard Chromium Plating

*Question:* Can you supply me with a formula for hard chromium to be applied to punch press tools?—E. H. P.

*Answer:* We suggest that you refer to pages 11-13 of the 1943 edition of the *Plating and Finishing Guidebook* which contain all the details necessary for your purposes.

# Dictionary of Metal Finishing Chemicals

**Mercuric Oxide, Red:**  $HgO$ . Mol. wt. 216.61. Sp. gr. 11.2. Bright orange red powder. Also known as Red Mercury Oxide. Decomposes when heated. Almost insoluble in water. Soluble in acids. Insoluble in alcohol. Grades: Technical, U. S. P., N. F., C. P. Containers: Bottles, Cartons (1, 5 lb.); Boxes (1, 5, 25 lb.); Drums (25, 100 lb.); Kegs (200 lb.).

**Mercuric Oxide, Yellow:**  $HgO$ . Mol. wt. 216.61. Sp. gr. 11.0. Orange yellow powder or yellow precipitate. Also known as Yellow Mercury Oxide. Almost insoluble in water. Soluble in acids. Insoluble in alcohol. Decomposes when heated. Grades: Technical, U. S. P., N. F., C. P. Containers: Bottles, Cartons, Cans (1, 5 lb.); Drums (25, 100 lb.).

**Mercuric Sulfate:**  $HgSO_4$ . Mol. wt. 296.67. Sp. gr. 6.47. Rhombic colorless crystals or white powder. Also known as Mercury Sulfate, Mercury Bisulfate. Decomposes when heated and when dissolved in water. Soluble in acids and sodium chloride solutions. Insoluble in alcohol. Grades: Technical, Purified, C. P. Containers: Bottles (1, 5 lb.); Jars (25, 100 lb.); Kegs (100 lb.).

**Mercuric Sulfide, Black:**  $HgS$ . Mol. wt. 232.67. Sp. gr. 7.67. Cubic black crystals or amorphous powder. Also known as Ethiops Mineral, Black Mercury Sulfide. Sublimes when heated to 580°C. Insoluble in water. Soluble in aqua regia, sodium sulfide solutions and alkalis. Insoluble in nitric acid, alcohol. Grade: Technical. Containers: Bottles (1, 5 lb.); Wood Kegs.

**Mercuric Sulfide, Red:**  $HgS$ . Mol. wt. 232.67. Sp. gr. 8.09. Hexagonal red crystals or powder. Also known as Red Mercury Sulfide, Vermilion, Artificial Cinnabar, Red Mercury Sulfuret. Sublimes when heated to 580°C. Insoluble in water, nitric acid and alcohol. Soluble in aqua regia, sodium sulfide solutions. Grades: Technical, C. P. Containers: Bottles (1, 5 lb.); Wood Kegs.

**Mercurous Chloride:**  $HgCl$ . Mol. wt. 236.07. Sp. gr. 7.15. M. P. 302°C. B. P. 384°C. Tetragonal white crystals or powder. Also known as Calomel, Mercury Monochloride. Insoluble in water. Soluble in aqua regia,

This is the twelfth consecutive installment of the alphabetical listing of chemicals used in electroplating.

mercuric nitrate solutions. Slightly soluble in hot nitric acid and hot hydrochloric acid. Insoluble in alcohol. Grades: Technical, U. S. P., C. P. Containers: Bottles (1, 5 lb.); Boxes (1, 5, 25 lb.); Drums (25, 100 lb.); Kegs (100, 350 lb.); Barrels (250 lb.).

**Mercurous Nitrate:**  $HgNO_3$ . Mol. wt. 280.63. Sp. gr. 4.8. M. P. 70°C. Monoclinic colorless efflorescent crystals. Also known as Mercury Protoneitrate. Decomposes in water. Soluble in dilute nitric acid. Insoluble in ammonia. Grades: Technical, C. P. Containers: Bottles (1, 5 lb.).

**Mercurous Sulfate:**  $Hg_2SO_4$ . Mol. wt. 497.28. Sp. gr. 7.12. Monoclinic colorless crystals or slightly yellowish crystalline powder. Decomposes when heated. Very slightly soluble in water. Soluble in sulfuric acid and nitric acid. Grades: Technical, C. P. Containers: Bottles (1, 5 lb.).

**Mercury:**  $Hg$ . At. wt. 200.61. Sp. gr. 13.55. M. P. —38.85°C. B. P. 357°C. Silvery, metallic liquid. Also known as Quicksilver. Insoluble in water and dilute acids. Soluble in nitric acid. Grades: Technical, U. S. P., redistilled. Containers: Jugs (1, 5 lb.); Bottles, Jugs (10 lb.); Flasks (75-76 lb.).

**Mercury Bichloride:** See Mercuric Chloride.

**Mercury Biniodide:** See Mercuric Iodide.

**Mercury Bisulfate:** See Mercuric Sulfate.

**Mercury Chloride:** See Mercuric and Mercurous Chloride.

**Mercury Cyanide:** See Mercuric Cyanide.

**Mercury Monochloride:** See Mercurous Chloride.

**Mercury Nitrate:** See Mercuric Nitrate.

**Mercury Oxide, Red:** See Mercuric Oxide, Red.

**Mercury Oxide, Yellow:** See Mercuric Oxide, Yellow.

**Mercury Protochloride:** See Mercuric Chloride.

**Mercury Protoiodide:** See Mercuric Iodide.

**Mercury Sulfate:** See Mercuric Sulfate.

**Mercury Sulfide, Black:** See Mercuric Sulfide, Black.

**Mercury Sulfide, Red:** See Mercuric Sulfide, Red.

**Mercury Sulfuret, Red:** See Mercuric Sulfide, Red.

**Methanal:** See Formaldehyde.

**Methanoic Acid:** See Formic Acid.

**Methanol:** See Methyl Alcohol.

**Methenyl Trichloride:** See Chloroform.

**Methyl Alcohol:**  $CH_3OH$ . Mol. wt. 32.042. Sp. gr. 0.7928. M. P. —97.8°C. B. P. 64.7°C. Colorless, volatile, inflammable liquid. Also known as Methanol, Columbian Spirit, Carbinol, Wood Alcohol, Wood Naphtha, Wood Spirit, Acetone Alcohol. Infinitely soluble in water, alcohol and ether. Grades: Crude (Wood Alcohol); Refined (Columbian Spirit), C. P., C. P.—low acetone. Containers: Bottles (1, 5 lb.); Jugs (1 gal.); Cans (1, 2, 5, 10 gal.); Barrels (50 gal.); Drums (55, 110 gal.); Tank Cars.

**Methylated Spirits:** See Denatured Alcohol.

**Methyl Benzene:** See Toluene.

**Methylbenzol:** See Toluene.

**Methyl Carbinol:** See Methyl Alcohol.

**Methyl Phenol, Meta:** See Cresol, Meta.

**Methyl Phenol, Ortho:** See Cresol, Ortho.

**Methyl Phenol, Para:** See Cresol, Para.

**Microcosmic Salt:** See Sodium Ammonium Phosphate.

**Milk of Lime:** Water suspension of calcium hydroxide, q. v.

**Milk Sugar:** See Lactose.

**Mineral Butter:** See Antimony Chloride.

Abbreviations: Mol. Wt. = Molecular Weight; Sp. gr. = Specific Gravity; M. P. = Melting Point; B. P. = Boiling Point; Solubility figures, where given, are parts by weight in 100 parts of water; Technical = Grade usually used for industrial purposes; Purified or Pure = Better grade than Technical; U. S. P. = Conforms to standards of U. S. Pharmacopoeia; C. P. = Chemically pure, exceeding requirements of the U. S. P.; N. F. = Meets requirements of the National Formulary.

**Mineral Carbon:** See Graphite.

**Mineral Jelly:** See Petrolatum.

**Mineral Oil:** See Petrolatum, Liquid.

**Mineral Pitch:** See Asphalt.

**Mineral Wax:** See Ceresin; Ozokerite.

**Minium:** See Lead Oxide, Red.

**Mixed Acid:** Mixture of sulfuric and nitric acids in any specified proportions.

**Modified Soda:** See Soda, Modified.

**Mohr's Salt:** See Ferrous Ammonium Sulfate.

**Molasses:** Syrup of varying composition but usually containing from 30 to 50% sucrose, q. v., 20% water, 10% ash, 15-20% organic non-sugars and varying amounts of reducing sugars. Derived from cane or beet sugar refining.

**Molybdenum:** Mo. At. wt. 95.95. Sp. gr. 10.2. M. P. 2620°C. Cubic silvery metal or gray black powder. Soluble in hot concentrated sulfuric acid. Insoluble in water and in hydrochloric acid, hydrofluoric acid and dilute sulfuric acid. Grades: 99.9% rod and wire; 95, 97% powder. Containers: Boxes (1, 5 lb.); Barrels.

**Molybdenum Trioxide:**  $\text{MoO}_3$ . Mol. wt. 143.95. Sp. gr. 4.50. M. P. 795°C. White or slightly yellowish powder. Also known as Molybdic Acid Anhydride, Molybdic Acid. Solubility, 0.1 at 20°C. and 2.1 at 100°C. Soluble in acids and ammonia. Grades: Technical, Purified, C. P. Containers: Bottles (1, 5 lb.); Boxes, Drums (25 lb.); Kegs (25, 50, 100 lb.); Barrels (250 lb.).

**Molybdic Acid:**  $\text{H}_2\text{MO}_4$ . Mol. wt. 161.97. Sp. gr. 3.112. White or yellowish powder. Also known as Molybdenum Trioxide. Decomposes when heated. Very slightly soluble in water. Soluble in ammonia and sulfuric acid. Grades: Technical, Purified, C. P.—assay minimum 85%  $\text{MoO}_3$ . Containers: Bottles (1, 5 lb.); Drums, Boxes (25 lb.); Kegs (25, 50, 100 lb.); Barrels (250 lb.).

**Molybdic Acid Anhydride:** See Molybdenum Trioxide.

**Monochloracetic Acid:** See Chloracetic Acid.

**Monosodium Orthophosphate:** See Sodium Phosphate, Mono.

**Monosodium Phosphate:** See Sodium Phosphate, Mono.

**Monsel's Salt:** See Ferric Sulfate, Basic.

**Montan Wax:** White to brown semi-hard wax. Derived from brown coal. Soluble in carbon tetrachloride, benzene, chloroform. Grades: Crude (brown); Refined (white), Bleached. Containers: Boxes (1, 5, 25 lb.); Bags (100 lb.).

**Mosaic Gold:** See Stannic Sulfide.

**Muriates:** See respective chlorides or hydrochlorides. Example: Ammonium Muriate: See Ammonium Chloride.

**Muriatic Acid:** See Hydrochloric Acid.

**Naphtha:** See Petroleum.

**Naphtha, Coal Tar:** See Naphtha, Solvent.

**Naphtha, Heavy:** Sp. gr. 0.925-0.950. B. P. 160-220°C. Flash point 78°C. Amber to dark red liquid. Also known as Crude Heavy Solvent Naphtha. A mixture of xylene, q. v., and higher homologic hydrocarbons. Grades: Technical. Containers: Cans (1, 5, 10 gal.); Drums (55, 110 gal.); Tank Cars.

**Naphtha, High Flash:** Sp. gr. 0.870-0.880. B. P. 150-200°C. Flash point over 38°C. Water white, volatile, liquid hydrocarbon mixture. Grades: Water white. Containers: Cans (1, 5, 10 gal.); Drums (55, 110 gal.); Tank Cars.

**Naphtha, Petroleum:** See Petroleum Ether.

**Naphtha, Solvent:** Sp. gr. 0.862-0.892 (crude); 0.862-0.872 (refined). B. P. 160°C. (80% crude, 90% refined). Flash point about 26°C. Water white or straw colored liquid. Also known as Coal-Tar Naphtha and 160° Benzol. Mixture of benzene, toluene and xylene with higher homologic hydrocarbons from coal tar. Grades: Crude (straw colored); Refined (water white). Containers: Cans (1, 5, 10 gal.); Drums (55, 110 gal.); Tank Cars.

**Naphtha, Solvent; Crude Heavy:** See Naphtha, Heavy.

**Naphtha, Wood:** See Methyl Alcohol.

**Naphthalene:**  $\text{C}_{10}\text{H}_8$ . Mol. wt. 128.164. Sp. gr. 1.145. M. P. 80.2°C. B. P. 217.9°C. Colorless, monoclinic crystals and white flakes or balls with strong tar odor. Also known as Tar Camphor, White Tar. Insoluble in water. Slightly soluble in alcohol. Soluble in benzene. Very soluble in chloroform, carbon disulfide, ether.

Grades: Crude, Resublimed, U. S. P., C. P. Containers: Bottles, Cans, Cartons, (1, 5 lb.); Drums (100 lb.); Bags (100, 200 lb.); Barrels (175, 200, 225, 250 lb.).

**Naphthol, Beta:**  $\text{C}_{10}\text{H}_7\text{OH}$ . Mol. wt. 144.164. Sp. gr. 1.217. M. P. 122°C. Colorless, monoclinic leaves or white powder. Also known as 2-Naphthol, 2-Hydroxynaphthalene. Very slightly soluble in water. Soluble in alcohol, ether, oils, glycerine, alkalies, chloroform. Grades: Technical, Resublimed, U. S. P. Containers: Cartons (1, 5 lb.); Kegs, Boxes (25 lb.); Drums (100 lb.); Barrels (250, 300, 350 lb.).

**Naphthol Hydroxynaphthalene, 2-2:** See Naphthol, Beta.

**Nickel:** Ni. At. wt. 58.69. Sp. gr. 8.90. M. P. 1452°C. Cubic, silvery, hard metal with slight yellowish tinge. Insoluble in water. Soluble in nitric acid. Slightly soluble in sulfuric acid, hydrochloric acid. Grades: Technical, C. P., C. P.—low cobalt. Containers: C. P.—Cans (1, 5 lb.); Shot; Granules; Sheet; Powder; Wire.

**Nickel Acetate:**  $\text{Ni}(\text{CH}_3\text{COO})_2 \cdot 4\text{H}_2\text{O}$ . Mol. wt. 248.84. Green crystals or solution. Decomposes when heated. Soluble in water. Insoluble in alcohol. Grades: Technical, Purified, C. P., C. P.—cobalt free. Containers: Bottles (1, 5 lb.); Tins, Boxes (25 lb.); Solution—Carboys (12 gal.); Barrels (50 gal.).

**Nickel Ammonium Sulfate:**  $\text{NiSO}_4(\text{NH}_4)_2\text{SO}_4 \cdot 6\text{H}_2\text{O}$ . Mol. wt. 394.99. Sp. gr. 1.92. Blue-green, monoclinic crystals. Also known as Double Nickel Salt. Solubility, 10 at 20°C. and 30 at 80°C. Grades: Technical, Purified, C. P. Containers: Bottles (1, 5 lb.); Bags (1, 5, 10, 25 lb.); Cartons, Boxes (50, 100 lb.); Kegs (100, 125 lb.); Barrels (400, 425, 450 lb.).

**Nickel Carbonate:**  $\text{NiCO}_3$ . Mol. wt. 118.70. Light green crystals or powder. Decomposes when heated. Insoluble in water. Soluble in acids. Grades: Technical, C. P., C. P.—cobalt free. Containers: Bottles (1, 5 lb.); Cans, Cartons (5, 10, 25, 50 lb.); Kegs (100 lb.); Barrels (200 lb.).

**Nickel Carbonate, Basic:**  $2\text{NiCO}_3 \cdot 3\text{Ni}(\text{OH})_2 \cdot 4\text{H}_2\text{O}$ . Mol. wt. 587.58. Light green crystals or powder. Decomposes when heated. Insoluble in water. Decomposes in hot water. Soluble in acids. Grades: Technical. Containers: Cartons (1, 5, 10, 25, 50 lb.); Kegs (100 lb.); Barrels (200 lb.).

(To be continued next month)

*Abbreviations:* Mol. wt. = Molecular Weight; Sp. gr. = Specific Gravity; M. P. = Melting Point; B. P. = Boiling Point; Solubility figures, where given, are parts by weight in 100 parts of water; Technical = Grade usually used for industrial purposes; Purified or Pure = Better grade than Technical; U. S. P. = Conforms to standards of U. S. Pharmacopoeia; C. P. = Chemically pure, exceeding requirements of the U. S. P.; N. F. = Meets requirements of the National Formulary.

# Patents

## Corrosion Prevention of Magnesium

*U. S. Pat. 2,322,205.* H. K. DeLong, assignor to The Dow Chem. Co., June 22, 1943. In a method of treating uncoated articles of magnesium and its alloys, the steps which consist in immersing the article in an aqueous solution consisting essentially of more than about two per cent of a soluble chromate and from about 0.001 to about 0.01 per cent of the fluoride in the dissolved state. A potential of 0.2 to 10 volts or more may be applied to the article so as to make it anodic while immersed in the solution.

*Example:*

Sodium dichromate . . . . . 10 % by wt.  
Magnesium fluoride . . . . . 0.5% "

The pH is maintained at 4-4.5 by chromic acid additions. The articles are immersed for 1 hour at 100° C.

## Corrosion Prevention of Magnesium

*U. S. Pat. 2,322,208.* W. S. Loose and H. K. DeLong, assignors to The Dow Chem. Co., June 22, 1943. In a method of producing a protective coating upon articles of magnesium and magnesium base alloys, the steps which consist in subjecting the article to the action of a bath, the active constituent of which is a fluoride, to produce a coating on the article, and then subjecting the coated article to the action of an aqueous solution of water-soluble salt of an oxy-acid of an element selected from the group consisting of chromium, molybdenum, phosphorous, selenium, titanium, tungsten, and vanadium to increase the corrosion resistance of the coating thereon.

*Example:* Immerse in 25% hydrofluoric acid for 5 to 15 minutes at 25° C., rinse and then boil for 45 minutes in 10% sodium dichromate. Rinse and dry.

*Example:* Immerse in 25% hydrofluoric acid for 5 to 15 minutes at 25° C., rinse and anodize for 10 minutes at 50° C. and 45 volts in:

Sodium dichromate	0.25%
Sodium hydroxide	2.0 %
pH=13.4	

## Corrosion Prevention of Metals

*U. S. Pat. 2,324,577.* H. J. Haffner, G. A. Siegelman and G. H. von Fuchs, assignors to Shell Development Co., July 20, 1943. A composition of matter suitable for protecting metals from corrosion comprising an aqueous colloidal dispersion of a polycarboxylic acid possessing anticorrosive properties and having at least 16 carbon atoms, said polycarboxylic acid being substantially chemically stable when exposed to atmospheric conditions, the amount of said acid in said dispersion being between .0001% and .1%.

*Example:* Alkyl succinic acids, alkyl phthalic acids, alkyl naphthalic acids and polymerized oleic acids.

## Chromium Plating

*U. S. Pat. 2,327,676.* J. W. Spence, assignor to Du-Repel Corp., Aug. 24, 1943.

Process for plating chromium upon a metallic member comprising placing said member in a boiling cleaning solution, making said member alternately cathodic and anodic while in said solution, rinsing said member after removal from said solution, making said member anodic while in a sulphuric acid-glycerine bath consisting of 66% sulphuric acid, 5% glycerine and the balance being water, plating said member with chromium by electrolysis in a chromic acid plating bath where the temperature of said member is elevated, and then placing said member in a mass of slowly cooling molten material.

## "Bronzing" Steel

*U. S. Pat. 2,327,870.* C. D. Coxe, assignor to Remington Arms Co., Inc., Aug. 24, 1943. The process of finishing the surfaces of ferrous articles comprising: subjecting the articles to anodic oxidation in a sodium hydroxide solution with a specific gravity of substantially 1.3 to 1.4 and at a temperature between substantially 248° and 266° F. for substantially 30 minutes with a current density of substantially 100 amperes per square foot of article surface to form a steely gray hard tenacious oxide film covered with an exterior softer oxide film on the surface of the articles; and then removing the exterior oxide film leaving exposed the steely gray hard tenacious oxide film.

## Corrosion Prevention of Metals

*U. S. Pat. 2,329,065.* J. C. Lum and G. Jernstedt, assignors to Westinghouse Elec. & Mfg. Co., Sept. 7, 1943. An activating solution for treating metal surfaces to improve the subsequent formation of protective phosphate coatings on the metal surfaces comprising, in combination, an aqueous solution containing as its essential components a dialkali metal phosphate and water soluble metal salts selected from the group of metals consisting of tin, lead and arsenic.

*Example:* A small amount of one or more water soluble salts of tin, lead or arsenic is added to an almost saturated solution of disodium phosphate in an amount ranging from 0.5% up to 10% or more of the weight of the phosphate. The solution is slowly evaporated. The activating solution is prepared by dissolving the above dried salt in water to form a solution containing 0.1% to 2% of disodium phosphate and 0.005% to 0.05% of the tin, lead or arsenic salt, at pH of 8.0 to 8.5.

## Galvanizing Equipment

*U. S. Pat. 2,326,843.* P. C. Ely, assignor to National Tube Co., Aug. 17, 1943. An apparatus of the character described, conveyor means for conveying pipe and the like in relation to a coating tank, including a series of threaded conveyor rolls disposed transversely of the direction of longitudinal advance of the pipes, said rolls being disposed in a plane inclined downwardly toward said tank, a second series of threaded conveyor rolls disposed transversely of the longitudinal advance of the pipes and in a plane inclined upwardly away from the tank, means for driving all of said rolls at constant speed, the threads of said rolls being aligned to receive and support the pipes in

parallel relation and impart simultaneous forward and lateral movement thereto, said second series of rolls extending laterally at one side and beyond the first series of rolls, and means operable as the pipes move laterally beyond the first series of rolls for reversing the inclination of the pipes and engaging the same upon the second series of rolls.

## Galvanizing Equipment

*U. S. Pat. 2,326,844.* P. C. Ely, assignor to National Tube Co., Aug. 17, 1943. The method of continuously hot galvanizing pipes and the like which consists in continuously advancing a plurality of pipes in longitudinally stepped and laterally spaced relation into and through a galvanizing bath characterized by the constant conjoint longitudinal and lateral movement of said pipes, including immersing the advancing pipes endwise at a downward inclination with respect to the surface of the bath, reversing the inclination of the pipes in the bath, and removing said advancing pipes endwise through the surface of the bath, whereby the entire length of each pipe is immersed in the bath the same length of time.

## Electroplating Apparatus

*U. S. Pat. 2,327,386.* D. Ashby (England), assignor to The Union Switch & Signal Co., Aug. 24, 1943. Apparatus for supplying unidirectional current to a load without interruption upon failure of energy in the main supply conductors comprising, in combination with said main supply conductors, a reserve storage battery connected across said conductors in a direction to continue the supply of current of the same polarity as supplied from said conductors to the load, an asymmetric unit connected between a terminal of said battery and one of said main conductors, said asymmetric unit being poled in a direction such that current flowing from said battery to said conductors encounters the low resistance of said unit but current flowing from the conductors to the battery encounters the high resistance of said unit, whereby normally said battery will receive charging current through the high resistance of said unit and will maintain without interruption the supply of current to the load through the low resistance of said unit upon failure of energy in said main supply conductors, and an adjustable shunt connected around said asymmetric unit for regulating the charging rate of said battery.

## Polishing Wheel

*U. S. Pat. 2,327,900.* E. C. Jarm and LeV. Verzier, assignors to The Lea Mfg. Co., Aug. 24, 1943. An abrasive faced wheel comprising a wheel body having a peripheral firmly adherent sizing coat of glue and carbon black, and a layer of thermoplastic abrasive compound superposed on said sizing coat in firm adherence therewith and set to substantially non-plastic state.

## Plating Barrel

*U. S. Pat. 2,328,162.* E. J. Mercil, assignor to Mercil Plating Equipment Co., Aug. 31, 1943. Electroplating apparatus comprising in combination, a tank for electrolyte, a rotatable cylinder, removably

mounted therein for receiving articles to be plated, said cylinder having perforated walls through which the electrolyte is adapted to circulate and provided with an opening at its axis of rotation, a circulation pipe, the open end of which is located below the operating level of electrolyte within the tank and registers with but does not enter the axial opening in the cylinder, and a pump connected to said circulation pipe and adapted to withdraw electrolyte from the tank and force it into the said cylinder through said axial opening.

#### Tumbling Barrel

*U. S. Pat. 2,328,553. E. O. Hamren, assignor to Pangborn Corp., Sept. 7, 1943*  
A tumbling barrel comprising a plurality of side by side sections, head plates at opposite ends of a central one of said sections and rigidly secured thereto, means for rotatably supporting said head plates, means between each adjacent section for hingedly connecting them together, the connecting means between said central section and one of its next adjacent sections including a member pivoted to the central member at a point inwardly from the edge of the central member which is juxtaposed to said next adjacent section, means for oscillating said heads and affixed central section, and means for guiding the end sections in a generally trough shaped path during said oscillations.

#### Sanding Machine

*U. S. Pat. 2,328,613. A. C. Burleigh, assignor to Skilsaw Inc., Sept. 7, 1943*  
An abrading and polishing device comprising a frame, the lower part of the frame being a hollow oil reservoir, a motor mounted in said frame above the oil reservoir, a driving device projecting into the oil reservoir and operatively connected with said motor, an eccentric mounted on said driving device, a reciprocating member having an elongated opening into which said eccentric is received, two guide rods in said oil reservoir, one on each side of said eccentric, two guiding members integral with said reciprocating member, having openings into which the guides are received, a reciprocating actuating part connected with said reciprocating member and projecting through an opening in said oil reservoir, and an abrading or polishing member connected with said reciprocating actuating part.

#### Galvanizing Equipment

*U. S. Pat. 3,328,949. H. W. Bradley, assignor to Inland Steel Co., Sept. 7, 1943*  
In a metal-coating apparatus, in combination, a receptacle for a molten bath comprising metals of different specific weights one superposed on the other thereof and through which the article to be coated is passed, the interface between said metals at which dross accumulates being substantially coextensive with said bath, and shielding means for the article positioned to extend in such layer of dross as may occur at the interface between said metals, crosswise of such layer throughout the height of such layer and to a plane below the upper surface of the lighter metal, adjacent the exit of the article from the bath, for shielding the article from contact with dross exterior of the shielding means.

#### Abrasive Blasting

*U. S. Pat. 2,329,203. W. L. Keefer, assignor to Pangborn Corp., Sept. 14, 1943*  
In an abrading apparatus, a rotor including a plurality of propelling blades extending inwardly short of the axis of the rotor, a cup mounted with the open end thereof between the inner ends of said propelling blades and rotating with said rotor, a plurality of circumferentially spaced projections extending from the open end of said cup, means for guiding abrasive into the cup whereby the abrasive may build up centrifugally on the inner wall thereof, and means for deflecting abrasive from the open end of the cup at a predetermined zone in the rotation thereof for movement through the spaces between said projections so as to be engaged by said propelling blades.

#### Abrasive Blasting

*U. S. Pat. 2,329,204. W. L. Keefer, assignor to Pangborn Corp., Sept. 14, 1943*  
In an abrading apparatus, a rotor having a plurality of outwardly extending abrasive propelling blades of a length to dispose their outer ends sufficiently radially distant from the axis of the rotor to propel the abrasive at an abrading velocity, a centrally located end substantially cylindrical chamber mounted for rotation with said rotor substantially concentric of the axis of said rotor, one end of said chamber terminating adjacent said blades to constitute a discharge edge for abrasive, means to feed abrasive into the opposite end of said chamber and allow it to build up centrifugally on the inner surface thereof, and means for deflecting a portion of the accumulated abrasive from the chamber onto said blades adjacent the inner ends thereof at a predetermined point in the rotor's rotation.

#### Vapor Degreasing

*U. S. Pat. 2,329,674. W. D. Phillips and R. A. Van Fossen, assignors, by mesne assignments, to The Dow Chem. Co., Sept. 14, 1943*  
In a high-temperature cabinet adapted for use as a vapor process degreasing chamber, the combination of a relatively rigid side wall assembly and a yieldable bottom section; said yieldable bottom section comprising a liquid sump supported in said rigid side wall assembly and a relatively flexible partition surrounding and forming a part of the sump; said flexible partition consisting of two thicknesses of metal.

#### Stripping Electrodeposited Sheet

*U. S. Pat. 2,330,103. C. E. Yates, assignor to Anaconda Copper Mining Co., Sept. 21, 1943*  
The method of continuously stripping a thin sheet of electrodeposited metal from a rotating cathode with production of long lengths of such thin sheet without tearing thereof which comprises winding the sheet on a roll under such tension as to strip the sheet from the cathode, and subjecting the stripped sheet while substantially flat and under said stripping tension to a spreading operation in such manner that the stripping tension is distributed uniformly across the width of the sheet in such a manner that local areas of relatively high stripping strain are eliminated and that a substantially wrinkle-free sheet is obtained.

#### Electrolytic Polishing

*U. S. Pat. 2,330,170. R. W. Manuel, assignor to Crane Co., Sept. 21, 1943*  
A method of surface polishing zinc, copper and their alloys, comprising subjecting the metal to electrolytic action as an anode in a bath having a current density of not less than 200 amperes per square foot of surface being polished, the said bath consisting of water 100 parts by weight, chromic acid about 12.5 parts by weight, sodium dichromate about 37.5 parts by weight, acetic acid about 12.5 parts by weight, and sulfuric acid about 10 parts by weight.

#### Electropolishing Apparatus

*U. S. Pat. 2,330,562. F. E. Drummond and D. E. Bench, assignors to The Himmel Bros. Co., Sept. 28, 1943*  
In an electrolytic polishing and forming apparatus for manufacturing a composite strip having a backing strip and a thin shell-like covering strip of electropolished metal of the class consisting of stainless steels, copper, brass, nickel, Monel, cobalt, zinc, tin, lead, aluminum, iron and the alloys of said metals in a continuous process, comprising the means for feeding a thin, shell-like covering strip through an electropolishing bath, means for supporting said shell-like covering strip comprising a plurality of electrically conductive brush bristle friction contact members, which members are located closely adjacent to each other as it is passed through said electropolishing path, said contact members forming a continuous support therefor and preventing bending or bowing of said strip during the electropolishing step.

#### Tin Plating

*U. S. Pat. 2,330,608. J. S. Nachtman, Sept. 28, 1943*  
In a method of making coated ferrous metal material having a ferrous metal base and a uniformly adhering, perfectly bonded, smooth coating of tin, the steps in the order named of forming on the surface of said commercially cold rolled ferrous metal material a uniform, thin, film-like, adherent coating of a compound of said ferrous metal from said ferrous metal material of the class consisting of iron oxide, iron sulphide, and iron phosphate; then subjecting the film-like coated ferrous metal material to the action of an aqueous solution of an acid of the group consisting of hydrochloric and sulphuric acid to dissolve said film-like coating; then wet mechanically cleaning the same to remove said film-like coating completely therefrom; the film-like coating serving as a vehicle, the dissolution and removal of which is accompanied by removal of foreign materials on and rolled into the surface of said commercially cold rolled ferrous metal stock, thereby exposing a clean, smooth, bright uniform ferrous metal surface, free from overlying or imbedded foreign material, and of nascent or coating receptive condition, and having the mechanical and crystalline characteristics previously imparted thereto by cold rolling; and then immediately applying to said coating receptive surface of said ferrous metal material a coating of tin before exposing the coating receptive surface to the atmosphere.

# BECKMAN pH NOTES

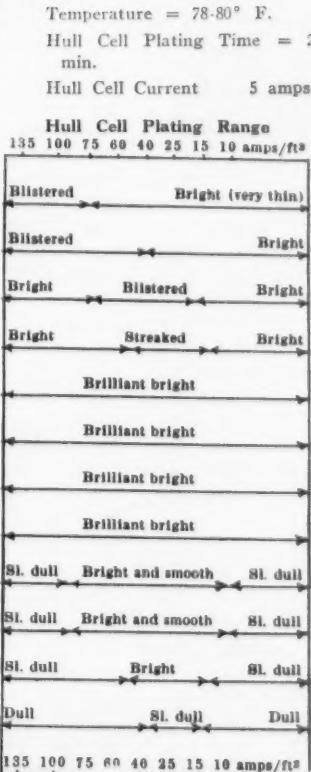
BETTER PLATING THROUGH MODERN pH CONTROL

NO. 7 OF A SERIES

Showing how pH affects plating of brass, cadmium, zinc, copper and similar metals.

**ZINC PLATING**  
 "Zin-O-Lyte" Process  
 Composition Oz./Gal.  
 "Zin-O-Lyte" 24.0  
 Salts 1.0  
 Addition Agent "O"  
 "Zin-O-Lyte" Brightener 0.25

Bath pH



SEND FOR THIS FREE BOOKLET

"What Every Executive Should Know About pH" . . . an interesting, informative booklet on the fundamentals of modern pH control. Ask also for Bulletin 86 which lists and describes Beckman instruments, electrodes and accessories!



**I**N BRIGHT ZINC PLATING proper control of the pH of the plating bath is essential to smooth bright coatings. For example, as the accompanying chart\* shows, in "Zin-O-Lyte" plating processes bright zinc deposits are obtained only within a comparatively restricted pH range. As the pH of the bath goes above this range the coatings become dull. As it falls below, the coatings become streaked and blistered.

Therefore, accurate pH control of the plating bath is essential for consistently smooth, uniform zinc deposits . . . and the only modern pH instruments with which such control can be maintained is with Beckman pH Equipment!

**Why?** Because only Beckman has developed the High pH Glass Electrodes required for alkaline cyanide baths . . . electrodes that for the first time permit the accuracy and simplicity of modern glass electrode pH control to be applied to highly alkaline plating solutions, even in the presence of sodium ions.

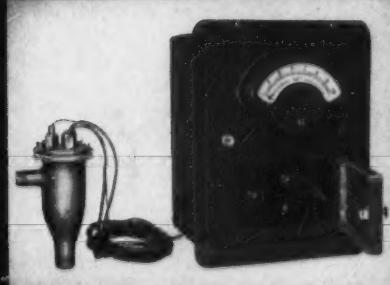
This Beckman development is of vital importance, not only in zinc plating, but in all brass, copper, cadmium and similar cyanide plating operations.

Whether your plating operations are on a small or large scale, investigate the vital savings in time and material that you can make with Beckman pH Control. There's a Beckman pH instrument to fit your requirements. Write for detailed information! *Beckman Instruments, National Technical Laboratories, South Pasadena, California.*

\* Gray-Proc. Amer. Electroplaters Soc.

**THE BECKMAN AUTOMATIC pH INDICATOR** is the most advanced pH instrument available for large-scale plating operations. Automatically indicates, records, and controls. Ask for Bulletin 16!

**THE BECKMAN INDUSTRIAL pH METER** is ideal for portable plant and field use in the electro-plating plant. Highly accurate, simple to operate, ruggedly built. Ask for Bulletin 21!



# NEW EQUIPMENT AND SUPPLIES

NEW PROCESSES, MATERIALS AND EQUIPMENT FOR THE METAL INDUSTRY

## The Alronox Process

Said to produce the even black, corrosion resistant finish on zinc or zinc alloy surfaces necessary for most war-time products of this type, "Alronox" has been developed and is being manufactured by The Alrose Chemical Co., Dept. MF, Providence, R. I. The material is applied by immersion.

No elaborate equipment or controls are necessary and it is claimed to be adaptable to all zinc and die cast surfaces and to be applied within a seven minute cycle. This non-electrolytic process has a salt spray rating of 200-300 hr. on .0002 zinc plate over steel, without after coating.

It is considered an excellent base for organic coatings.

## Professional Directory

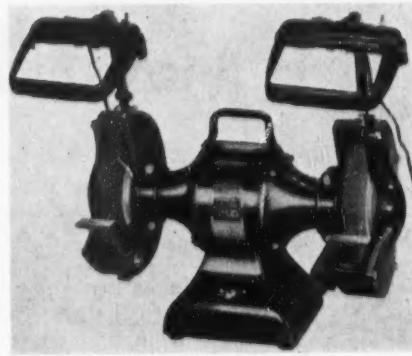
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64 Years in Precious Metals

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SALT SPRAY TESTING — CERTIFIED  
TO MEET ARMY AND NAVY SPECIFICATIONS. Testing of deposits-thickness, composition, porosity. Solution analyses, plant design, process development.  
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**JOSEPH B. KUSHNER, Ch.E.**  
**Metal Finishing Consultant**  
War plating plants designed and streamlined for increased production.  
LA 4-9794 233 W. 26th St.  
New York City



## Grinder Shield

With a completely redesigned frame molded from a high impact resisting, plastic material and with electrical parts in a completely insulated chamber and mounted on an adjustable bracket, The Boyer-Campbell Co., Dept. MF, 6540 Antoine St., Detroit, Mich., has announced a new model of Marvel Grinder Shield that provides properly directed light and protection for the face and eyes from flying particles. Light governed by a push button switch, is focused right on the work. The better visibility not only accounts for more rapid and accurate work but tends to avoid injury to the hands. The window is of non-shatterable glass and the lamps, of the bayonet type, are vibration resisting and are set-in flush with the frame.

## Three Jobs in One Operation

Process K, new metal processing chemical developed by Kelite Products, Inc., Dept. MF, Los Angeles, takes care of three jobs in one operation. A soak in the material cleans the metal, creates a tooth for painting or plating and inhibits the action of rust.

No critical time element is involved in the use of Process K. It is said to thoroughly remove grease, scale and corrosion but not to attack healthy metal.

## New Sweat Bands

Aldine Paper Co., Dept. MF, 373 Fourth Ave., New York, N. Y., are marketing their new Aldine Sweat Bands made of a covering of the company's patented, insoluble material over a cellulose fibre filler. Both filler and outer covering absorb perspiration.

The bands, as illustrated below, are made to fit any head size and to retain their shape even when saturated. They may be rinsed, dried and used over again. Samples and literature are available upon request.

## Rack Coverings

Two new products for covering plating racks made from Koroseal, its plasticized polyvinyl chloride thermoplastic material, have been announced by The B. F. Goodrich Co., Dept. MF, Akron, O.

One is known as Koroseal Tape RX; the second is Koralac RX, a solution of Koroseal. In some applications the two are used together, with the tape being applied after the rack has been coated with the solution, while in other cases they may be used separately.

Koroseal Tape RX is said to possess good resistance to wear and abrasion, to have excellent insulating properties and to be used for practically all kinds of plating service because of its resistance to all plating solutions, including chromic, alkali and acid dips.

Made in glossy black, Koroseal Tape RX is supplied in one pound rolls, containing approximately 170 lineal feet,  $\frac{3}{4}$ " wide by .014" thick, with the tolerance on width plus or minus  $\frac{1}{16}$ " and plus or minus .002" on thickness.

No special equipment is needed when Koroseal Tape RX is used in conjunction with Koralac RX solution, the rack being first treated with two or three coats of the solution and the tape then wrapped under firm tension, after which one or two more coats of the solution are again applied. If the tape is used alone, the rack must be placed in an air oven with a minimum temperature of  $300^{\circ}$  F. for two hours after the tape has been applied. This fuses the tape together.

The plating rack solution Koralac RX provides a corrosion resistant, tough, inert coating with good insulating properties, satisfactory for nearly all kinds of plating rack service, the company's announcement states. Liquid at room temperature, it holds its position on the racks after application because of shrinkage as the solvent evaporates.

Application of Koralac RX to plating racks can be accomplished by dipping or painting. All sharp edges of the rack must be removed by filing or grinding. Each coat should be allowed to dry thoroughly before the next is applied, with four coats minimum being generally recommended. The solution dries readily at room temperature, but drying can be hastened in an air oven at about  $150^{\circ}$  F.

The solution is supplied in one and five-gallon cans and 50-gallon drums. One gallon will coat approximately 80 square feet with a film thickness of .0015" when the dip method is used.

No Special Equipment Needed  
when you use new, easy-to-apply,  
low-cost, corrosion-resistant

# IRIDITE

• Applying this new anti-corrosive agent is as simple as A, B, C . . . and extremely economical. Yet, its super-thin coating protects zinc and cadmium plated parts from corrosive action to an unusual degree. And because it is so thin a coating, there is no "piling up" action that would alter the dimensions of a part. As a result, Iridite can be used to protect the most delicately machined and closely articulated parts without affecting their use or operation.

Caused by a chemical reaction with the plated metal itself, Iridite produces a uniform, opaque coating that is olive drab in color . . . the olive drab matching the familiar shade used by the armed forces for camouflage. The unusual flexibility of

Iridite permits parts to be bent, twisted or formed without chipping, flaking or affecting the corrosion-protective qualities of the Iridite coating.

Iridite offers every parts manufacturer the opportunity of expanding the usefulness of zinc and cadmium as protective coatings; making it possible to use these metals for plated parts under conditions of exposure ordinarily never considered.

If you manufacture parts that are exposed to weather or to corrosion (except containers for food), you should send, immediately, for full details on the Iridite process. Better still, send us a plated part for Iridite coating, and test it any way you like. See for yourself that Iridite will do what we claim for it.

## How to use IRIDITE



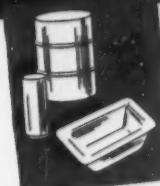
Plated parts are dipped into Iridite Solution from 10 to 60 seconds, and then are immediately rinsed in hot water.



As soon as the dipped part has been dried free of water, it can be handled without danger of injury, and shipped.



Only equipment needed is an acid-proof container for the Iridite Solution\* and one for the hot water rinse.

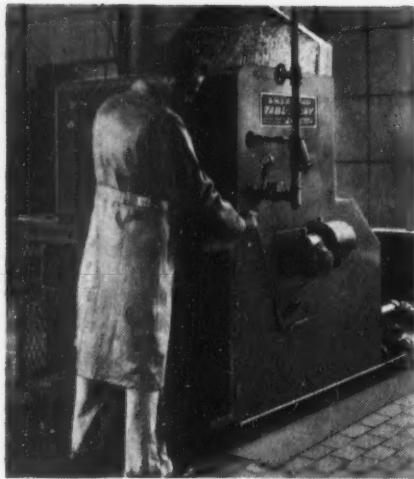


The Iridite Process can be applied to plated parts of any type or size, excepting containers for edible products.

\*Iridite Solution is used at from 75° to 100° depending on individual requirements.

**Rheem Research Products**  
INCORPORATED

Subsidiary of Rheem Manufacturing Co.  
2523 Pennsylvania Ave., Baltimore 17, Md.



### Metal Washing Machine

Designed to meet the need for high speed washing of flat, fragile work or circular parts with intricate pockets and crevices, the Tabl-Spray metal washing machine has been developed by American Foundry Equipment Co., Dept. MF, 555 S. Byrkit Street, Mishawaka, Ind.

Parts to be cleaned are placed on the mesh table and rotated through the spray solution, discharged from special machined non-clogging nozzles.

After the required washing time, the solution valve is closed and the parts are left rotating to obtain proper drainage. If

rinsing with fresh water is desirable, this operation can be handled without transferring parts to another compartment by means of a special arrangement of drain plates. A compressed air blow-off can follow the cleaning to remove excess liquid from the parts.

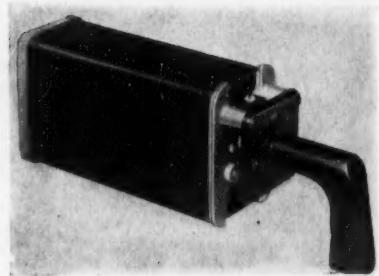
A system of straining devices placed in the path of the recirculated clean solution settles out all chips or foreign matter. The spray system is easily removable for cleaning and is fully accessible for adjustment.

The Tabl-Spray operates with either an alkali washing solution or with a solvent emulsion.

Parts measuring 25" in diameter and 12" high can be handled on the standard Tabl-Spray. Machines with 30" and 42" diameter tables for larger sized work are also available.

### Master Control Switch for Heavy Duty Service

A new master control switch for heavy-duty service has been announced by the General Electric Company, Dept. MF, Schenectady, N. Y. Designated Type SB-9, it is for use wherever repetitive operations of electrically operated devices run into many thousands per week. For example, it is claimed to be especially serviceable in steel mills for opening and closing control circuits from the control desk.



The new switch can be mounted on panels varying in thickness from  $\frac{1}{8}$ " to 2". It is rated at 600 volts, 20 amperes continuous, or 250 amperes for three seconds. Its interrupting rating is dependent upon the voltage and character of the circuit, and upon the number of contacts arranged in series. A table of interrupting ratings, as well as a detailed description of the Type SB-9 switch and its features, is contained in Bulletin GEA-4114, available on request to the company.

### Cleaner

Technical Processes Division, Colonial Alloys Co., Dept. MF, Colonial Philadelphia Building, Philadelphia 34, Pa., have announced an emulsifiable type cleaner designed for quick removal of oils and solid particle dirts and greases, especially those which are very hard and caked on.

The material is called "Running Gear Hydrocarbon Cleaner".

BEFORE DESCALING

AFTER DESCALING

AFTER ELECTROPLATING

CHEMICALLY CLEAN and ready for Plating FASTER

BECAUSE DESCALING BY THE BULLARD-DUNN ELECTRO-CHEMICAL PROCESS

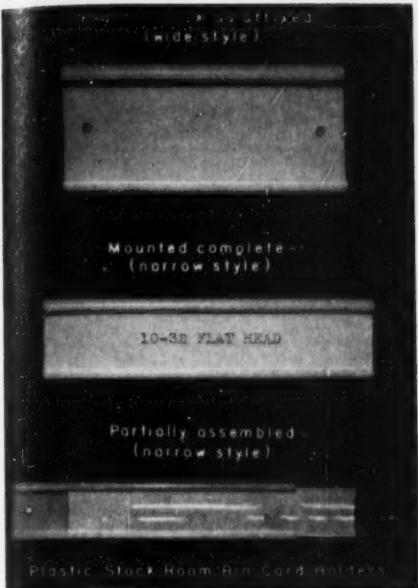
CHECK THESE FEATURES

- Rapid and economical
- No dimensional changes
- No etching
- Produces chemically clean surfaces
- Cleans out recesses
- Easy to operate
- Can be fully conveyorized
- Long solution life

• You save because it removes scale in a fraction of the time other methods require, hand wiping is eliminated, and perfect plating is assured. Remarkable "throwing power" makes the Bullard-Dunn Process valuable for parts with cavities like those pictured above. And you can use the same conveyors and racks as used for plating. Write today for booklet; send us samples with full information for an estimate.

**BULLARD-DUNN**  
*Process*

DIVISION OF THE BULLARD COMPANY  
BRIDGEPORT 2, CONNECTICUT



### Bin Card Holders

Plastic stock room bin card holders in a variety of shapes and sizes, available for immediate shipment, are the latest addition to the line of the Plastic Division of Hollywood Athletic Co., Dept. MF, 211 E. 7th St., Los Angeles 14, California. Stock widths of  $\frac{5}{8}$ ",  $\frac{7}{8}$ ", 1-7/16" may be had in stock lengths of 3", 4", or 5". They are supplied in ivory plastic.

The device is applicable to any flat surface—on wood by means of tacks for which holes are provided, or on metal with glue. It consists of the plastic holder itself, an insert tab on which description of the article may be typed, and a covering sheet of transparent plastic. Changes may be made simply by inserting revised card slips.

The material is practically soil-proof but is washable in addition. Complete descriptive folder, together with prices, will be sent upon inquiry to the company at the above address.



### "Fingerless" Steel Reinforced Glove

For many years steel reinforced gloves, mittens and handguards, as manufactured by the Industrial Gloves Co., Dept. MF,

**PLATING RACKS  
ARE ONLY AS GOOD  
AS THE METHOD  
BY WHICH THEY ARE  
Protected**



THE design and construction of a plating rack is important but, in the final analysis, the rack itself only serves as a skeleton over which protective coating materials can be applied. Without the right protective coating, the best rack ever made will not stand up effectively through your cleaning and plating cycles.

There is a right protective coating material for each of the various cycles in which racks may be used. One material alone will not provide all the characteristics to make it fully effective through all processes.

Miccro Products are available to meet your individual needs, not only for protective qualities necessary

MICCRO-SUPREME STOP-OFF LACQUERS

• MICCROLITE • MICCROFLEX

*Developed and Manufactured by Experienced Platers*

**MICHIGAN CHROME & CHEMICAL CO.**  
6348 EAST JEFFERSON • DETROIT, MICHIGAN

Danville, Ill., have been used in the handling of sheet metal, bars, rods, stampings, castings, etc. Recently, in view of the great amount of sheet metal stamping and the need for speedy handling on production lines, there has been a demand for a more flexible glove, without sacrifice of safety or wearing service.

This has been accomplished by developing the "fingerless" steel reinforced glove No. 14962, as pictured. A sturdy, chrome tanned cowhide glove, with finger and thumb tips removed, it is reinforced vertically with steel ribbons and is steel stitched. A leather patch adds extra wear and protection on palm and junction of palm and thumb.

### New Features Announced in Foxboro Valvactor

New capabilities, as well as new convenience and sturdiness, are featured in a new Foxboro Vernier Valvactor, just announced

by The Foxboro Company, Foxboro, Mass. The Foxboro Vernier Valvactor, familiar to users of control instruments in every field of industry, is a micro-positioner for pneumatic motor valves. It is used to insure precise and dependable valve response, especially where operating conditions may make the response uncertain, slow, or unsatisfactory. It is actuated by air pressure changes as slight as the equivalent of  $\frac{1}{2}$  inch of water, and can compel valve stem movements as small as 1/1000 of an inch.

The new unit retains the outstanding advantage of relay action. Flexure type bearings, in place of pivots, eliminate the effects of mechanical vibration, without loss of sensitivity. Finally, although the Vernier Valvactor retains the same general external appearance, new ruggedness has been provided for it by a heavier metal case. Complete specifications of the new type unit will be furnished by The Foxboro Company on request.

**Investigate our**



## **PALLADIUM PLATING SOLUTION**



The electrodeposition of Palladium on base metals has found many uses in a number of industries. Copper, brass, silver etc. can be plated with coatings of .00001" thicknesses at reasonable cost.

Palladium being a member of the platinum group family gives excellent corrosion and tarnish protection.

For further information on this brilliant white non-tarnishing plate write to:

## **PRECIMET LABORATORIES**

Division of **GEORGE C. LAMBROS**

Research & Development Engineers in Precious Metals

**64 Fulton Street**

**New York**

An advertisement for The Abbott Ball Company. The background is a dark, textured surface of small metal parts. In the upper left, there is a circular inset showing a machine. The main text reads: "Cutting Corners . . . for Top Speed Production" and "Rounding corners or removing burrs by grinding or filing is too slow and costly to meet today's demands for speed and economy." Below this, another text block says: "Barrel finishing has solved many such problems. Write to us about yours and send a few unfinished samples of your small, metal parts. We'll gladly tell you if they're adapted to finishing with Abbott barrels and materials." At the bottom, it says "The Abbott Ball Company" and "1046 New Britain Ave. Hartford, Conn.".

## **Manufacturers' Literature**

### **De-Scaling Manual**

Two major wartime maintenance problems are the insulating, power-robbing effect of lime scale and rust on many different types of water-cooled and water-circulating equipment.

Successful methods and techniques for removing and for restoring normal heat transfer efficiency are discussed in the newly revised and enlarged sixth edition of the Oakite De-Scaling Manual, published by *Oakite Products, Inc.*, Dept. MF, 18 Thames St., New York 6, N. Y.

The manual contains 28 pages of practical data that have been collated, in a concise, easy-to-read fashion to help works managers, plant superintendents, mechanical supervisors and other maintenance executives increase output of existing equipment, shorten shut-down time and conserve manpower in cleaning and de-scaling varied types of equipment common in the metal-working industry. Among them are blast furnace cooling coils, water-cooled brazing and annealing furnaces as well as gasoline and Diesel engine cooling systems, lube oil and jacket water coolers, refrigerant condensers and compressors, surface condensers, feed-water heaters and other heat exchangers.

### **New Method for Anodizing Zinc**

An informative 4-page leaflet describes Anozinc, a means of increasing the rust-resistance of zinc coated steel parts and of retarding the formation of white zinc corrosion products, which is claimed to be fast and easily controlled. It is applicable to zinc plated on any metal, and in some cases to zinc base die castings.

For parts now being plated or black finished, this treatment is said to mean improved appearance as well as longer service life. Parts finished in Anozinc baths have stood up in excess of 200 hours under the Army-Navy salt spray test AN-QQ-S-91.

Two finishes are available—a dark, semilustrous black and a brassy, slightly iridescent yellow.

The bulletin is sent on request to *United Chromium, Inc.*, Dept MF, 51 East 42nd Street, New York 17, N. Y.

### **Solvent Conservation**

Information of specific importance relating to the conservation of solvents is contained in a booklet issued by *Detrex Corporation*, Dept. MF, Detroit, Mich.

Numerous suggestions, incorporated in the article, are outlined and many valuable tips are given.

**FOR RESULTS  
ADVERTISE IN  
METAL FINISHING**

## Rubber Buckets

A new catalog section on its line of Flexite rubber pouring buckets for the safe and economical handling of acids, corrosives, and liquid high explosives has just been issued by *The B. F. Goodrich Co.*, Dept. MF, Akron, O., and is available upon request. The publication also describes Flexite rubber dippers, hard rubber funnels, and Anode Acid rubber gloves.

Among products described is a comparatively recent addition to the line—a rubber bucket developed especially for arsenals and shell loading plants. Made in a soft rubber compound of about 60 durometer hardness, the bucket is said to be so flexible it can be easily crushed and any solidified liquid cracked loose and readily removed. The bucket will not crack or break during rough usages, it is claimed. Secure anchorage of handles and reinforced gripping head at the base prevent spilling or injury to workmen.

## 50th Anniversary Catalog

Printing of the Golden Anniversary Edition of "Manhattan Rubber Products for Industry", a 140-page catalog of industrial rubber goods, has been completed by The Manhattan Rubber Mfg. Division of Raybestos-Manhattan, Inc., Dept. MF, Passaic, N. J. Copies are available on request.

Described in this new catalog are hundreds of mechanical rubber products and many other special items manufactured by the company, many available only for post-war use. Particular emphasis is given belts, hose, molded goods, packing, lathe cut and extruded rubber goods, friction material, rubber covering and abrasive wheels.

Engineering data on belting and hose and technical information on other products are included.

## Surface Roughness

The practical measurement of surface roughness is described in a new booklet published by *Physicists Research Co.*, Dept. 13, Ann Arbor, Mich., makers of the Profilometer.

Answers are given in the first section to the questions "What is surface roughness?" and "Why measure surface roughness?" The remainder of the book describes the Profilometer, for production measurement of surface roughness, as well as the accessories available for it.

The booklet is standard letter-size, 8 1/2" x 11", and contains eight pages.

## War Time Instruments and Services

*The Bristol Co.*, Dept. MF, Waterbury, Conn., has announced a bulletin containing general information on its line of industrial instruments for controlling and recording war-time processes.

The bulletin, in folder form, is virtually a buyers' guide of air and electric operated controllers, recorders, indicators and telemetering recorders and controllers. Bulletins covering each type of product are listed for those interested in further details.

A copy of this bulletin, No. DM006, may be had upon request.



# JUST A PLATING RACK

Perhaps to many, this is just another plating rack.

But, to the modern plater, it's more than just a plating rack—it's a means for increasing production, improving quality and lowering costs.

Back in the days when only a few pieces of this or that were to be plated, the work was hung on wires and, while the finished job was good enough, it was a slow and costly process.

Then, along with other modern production methods, came the use of racks or fixtures to hold the parts to be plated or anodized and which were usually designed to fit the job. The result has been increased production, uniformly better work and lower costs.

The cost of such racks and fixtures, many of them cleverly designed, is small compared to the saving in labor, the increased volume and the production prices their use made possible. Without them the present vast output of plated and anodized parts and units in war production would have been impossible.

Rack INSULATION is equally important: it must be a good dielectric to eliminate current loss; it must have excellent chemical resistance to acids, alkalies and hot cleaners; it must have good adhesion to the rack so that it will stand up for hundreds of cycles through the tanks. By avoiding current loss, preventing shading, reducing or eliminating spoilage and making racks last indefinitely, good rack insulation such as BUNATOL still further improves production and reduces costs.

BUNATOL is the accepted rack installation in hundreds of plants because it is the dependable, long-life, low-cost insulation for all plating and anodizing solutions.

In making your post-war plans, you should have latest information on BUNATOL RACK INSULATION. A letter will bring this information and samples if required. Put our more than eight years' experience in the EXCLUSIVE manufacture of insulation and Stop-Off for use in electro-plating and anodizing to work for you.

**NELSON J. QUINN CO. • TOLEDO 7, OHIO**

# BUNATOL

ENGINEERED INSULATION

## GEORGE A. SPENCER

George A. Spencer was born July 25, 1887, in Philadelphia. After a high school education he worked side by side with his father in the famous woolen textile mills of Philadelphia.

Mr. Spencer was married on October 4, 1917, and entered the armed forces on August 26, 1918. He was honorably discharged on January 19, 1919. A daughter, Florence was born on September 22, 1919.

In 1927 he moved to Chicago to make a survey for a plating firm which has taken over sixteen years, and which he said was never finished. He entered the plating supply business of Crown Rheostat & Supply Com-

pany some fourteen years ago, and through his able and industrious leadership, the company has greatly prospered. For the past seven years he has been President of this concern.

He was a 32nd degree Mason and the youngest man in his lodge to receive this honor.

Mr. Spencer was associated with the American Society for Metals, and also was active in War Production Committee work.

Funeral services were conducted by his minister and personal friend, the Reverend Benjamin M. Will, at the Country Church of the City on November 5, 1943.

Mr. Spencer is survived by his wife and daughter.

# PURICO PUR-BLAC

Black Finish for Steel & Iron  
One bath, low temperature salts

Let our Technical Department Process Samples for you.

## PURICO ZN BLACK

A hard adherent black for zinc and  
zinc die castings

## PURICO A. P. I.

(Acid Pickling Inhibitor)

## PURICO PUR-BUR

A new compound for the deburring  
of aluminum

## THE PURITAN MFG. CO.

WATERBURY, CONNECTICUT

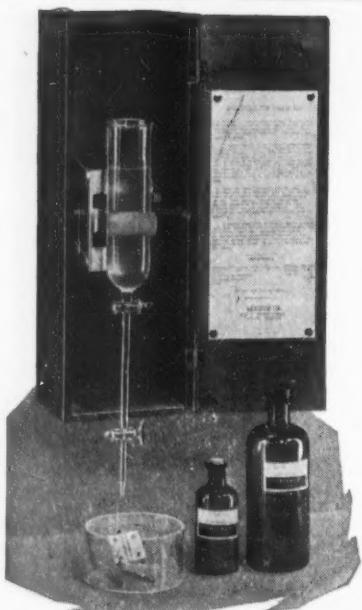
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Minneapolis, Minn.



## ZINC SOLUTIONS & DEPOSITS

Controlled with simple direct  
reading test sets.

Sets for other solutions and deposits  
also available

Write for Leaflets

KOCOUR CO.  
4720 S. CHRISTIANA AVE.  
CHICAGO 32, ILL.

## New Books

*Patent Law.* By Chester H. Biesterfeld. Published by John Wiley & Sons, Inc., New York City. 1943. 225 pp. including index. Price \$2.75. This book is based on a series of lectures which was primarily designed for chemists, engineers and students who desired to acquire an understanding of the basic principles of patent law. Quotation of pertinent sections from important court decisions helps to make this volume a valuable reference work for the practical man and scientist who may at times be responsible for developments having possible patentable features. Permissible breadth of chemical claims and the subject of trade secrets are of special interest to metal finishers.

### Safeguarding the Woman Employee

The advent of women in plants and factories, performing jobs with ever-present physical hazards, has brought to the fore the problem of educating women workers in safe working methods. To assist the industrial executive in formulating a safety program designed to make the woman employee safety-conscious, the Policyholders Service Bureau of the Metropolitan Life Insurance Co. recently issued a report entitled, "Safeguarding the Woman Employee."

According to the findings of this study, successful safety training begins at hiring. At that time, many industrial employment supervisors outline the company's rigid safety rules. In some cases, the female applicants for employment are required to attend a short orientation course, during which an experienced safety supervisor points out to them the nature of their jobs and the hazards attached to them. Through talking-moving pictures, showing machines at work, the safety and health hazards are pointed out. Personal tours of the plant are conducted, demonstrating the points brought out in the orientation course.

The report shows that one difficulty frequently met is the woman worker's resistance to the use of company-prescribed uniforms. This attitude has been overcome in some cases by allowing the women employees to vote on several models of work clothing. Much of the resistance disappears when the required models are of their own selection.

As in any other safety program, it is necessary to keep the idea of safety before the women workers. The report lists such media as company broadcasts, posters, scoreboards, movies, meetings, employee magazine articles, illustrations, and exhibits for keeping the safety idea prominent.

Copies of this study are available to executives who address the Bureau on their business stationery. Address: Policyholders Service Bureau, *Metropolitan Life Insurance Co.*, Dept. MF, 1 Madison Ave., New York 10, N. Y.

## Associations and Societies

### American Electroplaters' Society Los Angeles Branch

Already looking toward 1944, Los Angeles Branch of the A.E.S. at its November 8 meeting appointed a committee chairman to investigate the propriety and advisability of holding an annual educational session next spring.

*Marcus Rynkofs*, whose direction of these affairs in the past several years has earned the merited approval of the membership, was named chairman, with the privilege of selecting his own assistants. He was instructed to report the committee's findings at the December meeting at which time the branch will make its final decision on whether or not to sponsor a 1944 educational session.

*Ernest Lamoreaux*, who was delegated at the October meeting to invest a portion of the branch's surplus funds in war bonds, delivered a \$500 bond to the keeping of Treasurer *Carroll McLaren*.

Vice-president *Joseph Sunderhaus*, presiding in the absence of President *Emmette R. Holman*, officiated at the induction into active membership of *Leon Braine* of *Thompson Products, Inc.* *Clarence Spence* was reinstated as an active member, and the resignation of *Erwin Frauenhoff*, who is no longer connected with the plating industry, was accepted. Application for associate membership was received from *Howard Woodward* of the *Hard Chrome Engineering Co.*

The reading by *Earl Coffin*, chairman of the Educational Committee, of an abstract of a paper on hard chrome plating which appeared in the 1943 Convention Proceedings precipitated a spirited discussion on heat treating and its relation to the plater.

Opinions presented by various members were to the effect that much of a plater's trouble arises from the fact that half the heat-treated pieces arriving in a plating shop can be worked successfully and the other half can not. Uniformity in heat treating was recommended as the solution. The suggestion was made that if heat-treaters had a more intimate understanding of the problems of platers, improvements in heat-treating techniques undoubtedly would result.

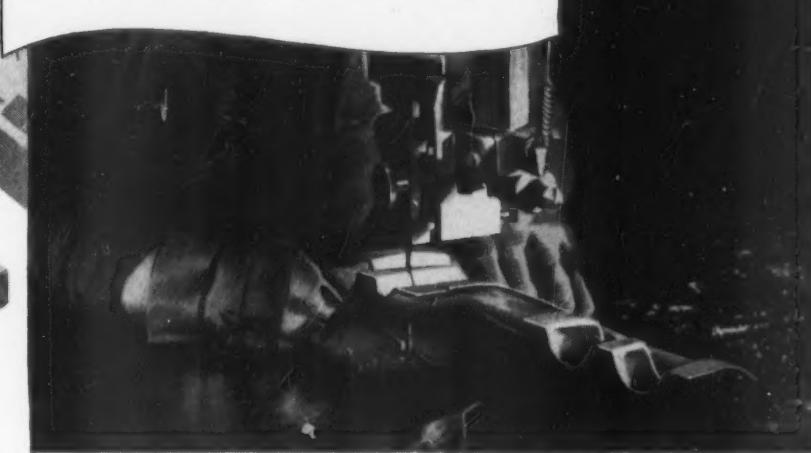
Mr. Coffin's subsequent suggestion that the branch hold a special meeting devoted to discussion of heat-treating with members of that profession met with instant approval. Mr. Coffin thereupon was delegated to invite a number of the city's leading heat-treaters to either the December or January meeting so that open discussion of the various problems involved could be held.

The speaker of the evening was *Stewart Ingrams*, representative of the Los Angeles office of the War Production Board. He talked on how future priorities are going to affect the plating industry.

Mr. Ingrams prefaced his main discus-

## Ingenious New Technical Methods

Presented in the hope that they will prove interesting and useful to you.



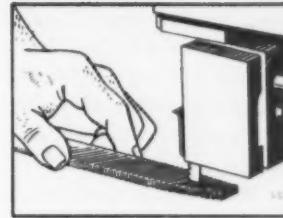
### Hard Steels Cut by Heat Generated by Super High Saw Speeds

Ordinary band-saws, when operated at unbelievable high speeds up to 12,000 feet per minute, cut through hard steels and alloys by heat generated from the friction of the saw against the metal to be cut. The cutting effect is more that of burning through the metal than actual cutting. The heat generated is sufficient to melt or burn out the metal in the saw cut but not enough to draw the temper on the sides.

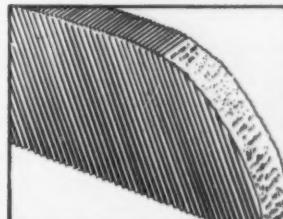
The hardness of either saw or metal to be cut is of little importance. Thin metal sheets are cut like paper, and plates up to one inch in thickness can be cut at speeds of ten inches per minute.

We hope this has proved interesting and useful to you, just as Wrigley's Spearmint Gum is proving useful to millions of people working everywhere for Victory.

You can get complete information about this method from Bell Aircraft Corporation, Buffalo, New York.



Proof of ability of new method to cut hard materials is demonstrated by operator cutting a file.



The temper of curve cut section shown above is unaffected.

X-60

sion, which dealt with the status of various metals, by outlining the functions of the department of priorities and explaining the three categories of materials. He defined these latter as capital equipment, MRO materials for repair and operation, and materials for production.

In regard to the shortage of various metals, he said copper is strongly restricted at present, with no indications that platers will do much copper work for months to come. The nickel situation is even tougher than the copper one, he stated with some of the biggest problems in the metal situation developing in regard to nickel.

Chromium, according to Mr. Ingrams, is not so severely restricted as some of the other metals. Small amounts, he said, can

be obtained without trouble, but large amounts still require allocation procedure.

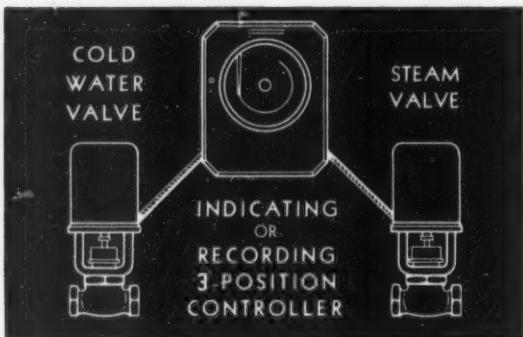
He characterized the situation in respect to cadmium as "very tight." Silver, he explained, "is only mildly restricted" and is easily obtainable, except that manufacturing jewelers are limited to 50% of the amount they formerly used.

Zinc, the W.P.B. official, stated, has been tight, "... but is easing up somewhat." Rhodium, he explained, is restricted only insofar as it is used for plating for jewelry, and gold is limited to a percentage of the amount formerly used.

Tin, Mr. Ingrams declared, "... is one of the rarest of all the elements at present and there is no easing of restrictions in sight."

## BARBER-COLMAN CONTROL SYSTEM

### FOR MAINTAINING UNIFORM TEMPERATURE OF CHROMIUM PLATING BATHS...



This automatic control system provides a simple, economical, and dependable means for maintaining the required temperature of chromium plating baths. As the diagram shows, it uses two Barber-Colman two-position electric MOTOR-OPERATED valves governed by a standard 2-position indicating or recording controller. If the bath temperature is low, the steam valve opens; if the temperature gets high, the cold water valve opens; when the bath is exactly right, both valves are closed.

#### USE MOTOR-OPERATED VALVES FOR BEST RESULTS

Barber-Colman electric motor-operated Valves offer a number of advantages on tank control systems. They will provide reliable operation because of positive power-driven seating. Current is consumed only when the valve is changing position, no holding current being required. Motors are available for either low-voltage or high-voltage lines. Construction is of high quality to assure long life and low maintenance. For durable, dependable service, use Motor-Operated Valves.

Write for Bulletin "CONTROLS for INDUSTRY"

**BARBER-COLMAN COMPANY**

1205 ROCK STREET  
ROCKFORD, ILLINOIS

## PESCO

A NAME THAT MEANS BETTER PLATING AND POLISHING EQUIPMENT & SUPPLIES

Just a Reminder that

**The Plating Equipment & Supply Co.**  
is a distributor of

Nuglu & Brushing Nuglu—All grades  
Light & Coarse Tampico, Bristle, Brass,  
Copper, Hair, Wire Brushes in Stock  
All shapes—sizes  
Felt Wheels—Buff—Polishing Wheels  
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Abrasives—Pumice stone & powder  
Hide glue—Grinding wheels—Accessories  
Safety Equipment—Shields, respirators, etc.  
Rubber & Asbestos gloves & Aprons  
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Continental AC & DC motors—Starters  
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Tanks of—All types & sizes  
Grinding machines—Buffing Lathes  
Centrifugal Dryers—  
Tumbling & Deburring Equipment  
Spraying Equipment

"If It's Metal Finishing Equipment, We Have It."

**PLATING EQUIPMENT & SUPPLY CO.**  
182-184 Grand Street  
New York, N. Y.

CAnal 6-5249-8972

### News from California By FRED A. HERR

The Metal Finishing & Manufacturing Corp. has been organized at Los Angeles with E. C. Simmons as president, R. A. Ingold as vice-president, and G. J. Levingston as secretary-treasurer.

The firm was established to manufacture aircraft parts for Southern California plane plants and will do all the electroplating required for turning out plane parts ready for use by the assembly plants.

J. R. Hyatt has been brought out from Detroit, Mich., to take charge of the production control department of the Barker Grinding Co. of Los Angeles.

Cadmium and Nickel Plating Co., 1400 Long Beach Blvd., Los Angeles, has installed new equipment for handling government contracts requiring gold and silver plating work on electronic instruments.

For this work the company is using a silver tank 8 ft. long, 18 in. wide and 24 in. deep, and a 15-gallon gold solution tank 18 x 18 in. in dimension. The difference in size of the two tanks is due to the fact that items to be gold-plated are inserted only two at a time while those to be silver-plated are racked and plated in large quantities.

Robert "Bob" Gripp, plating room foreman, told this reporter of an ingenious special anode which he has devised for use in the silver tank. The electronic instruments, which comprise the bulk of the work treated in the silver tank, are tubes about 10 inches long and two inches in diameter, the inside of which must be silver plated.

To expedite the work and assure efficient deposit, Mr. Gripp has designed a round rod anode of eight-inch length which can be inserted inside the tube. The articles to be plated are hung on a rack and the special shaped anodes, fitted to a Bakelite holder, are slipped into the tube-shaped tuning instruments.

Mr. Gripp also described an ingenious scrap anode holder, made out of Bakelite, which the company has found practical for using up the scrap from anodes which have served their purpose in plating the interiors of the tubes.

This device consists of a round section of Bakelite tubing, one end stopped off with a Bakelite plug. The tube has perforations at frequent intervals to permit the solution to flow through freely. A wire extends down the inside of the tube, crosses at the bottom and runs up the other side. Scrap silver is cut up and dropped into the Bakelite tube which serves as an anode holder and the wire makes the connection. Mr. Gripp declared that silver scrap was resorted to because silver shot was not readily obtainable.

Final equipment has been installed in the plating department of Phelps Dodge Copper Products Corp., Los Angeles, and the metal finishing room, which was originally set up about a year ago, is now working two shifts, chromium plating tools, plugs and dies designed for draw-bench work in the making of condenser tubes for the Navy. The shop does chromium plating exclusively. It

equipment now consists of a 300-gallon chromium tank, a 105-gallon reverse tank, two rinse tanks and a 700-ampere generator. *Forrest Braime* is plating room foreman.

*Weber Showcase & Fixture Co.* is erecting a 120 x 375 foot addition to its plant at 5700 Avalon Blvd., Los Angeles, at a cost of \$80,000. Another factory addition, 40 x 240 feet in dimension, calls for an expenditure of \$10,000.

One of the recent major activities of this firm was the production of large number of cowl ventilators for cargo ships. These were finished on a sub-contract basis by the *Commercial Sandblast Co.* and zinc dipped in the plant of the *Western Galvanizing Co.*, Los Angeles. Cowl screens were similarly finished.

*Federated Metals Co.*, a unit of *American Smelting & Refining Co.*, has purchased the plant of the *Pacific Smelting Corp.* at Torrance, Calif., for a sum announced as \$100,000. *M. D. Schwartz*, son of *John Schwartz*, Pacific Coast manager of Federated Metals Co., has been installed as manager of the Torrance plant, which is reported to be the only zinc residue plant west of Chicago.

*Anthony Schullo*, who served as superintendent of the *Hallenscheid-McDonald Co.*'s Plant No. 2 plating shop in the pre-war days, when *Donald Bedwell* was general superintendent of the firm's combined plant operations in Los Angeles, has severed his connection with *Mare Island Navy Yard*, San Francisco, to affiliate himself with *Western Pipe and Steel Co.*, Los Angeles.

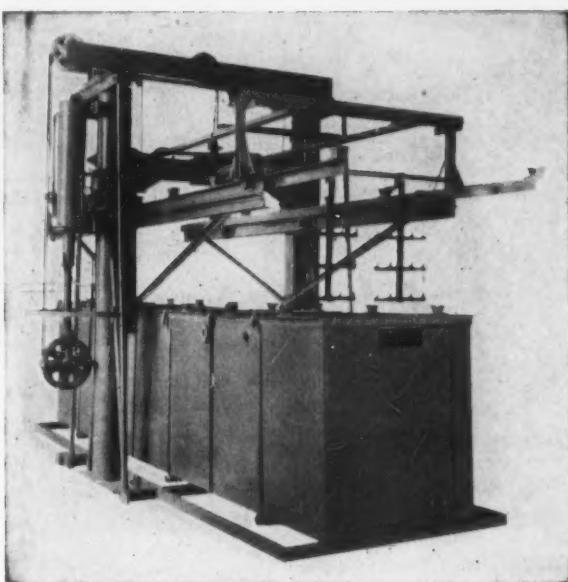
Schullo has been active in the plating industry of Southern California since 1923, serving at various times with *Royal Plating Co.*, *DeLuxe Plating Co.*, *S & M Lamp Co.* and *Hallenscheid-McDonald Co.*

*Jean Rynkofs* who was learning the plating business in his father's *Liberty Plating Co.* in Hollywood when the Japs bombed Pearl Harbor, is now guarding Japs in an internee camp not far from the site of the bombing. Jean, now a P.F.C. in the Marine Corps, wrote recently of a trip he made on a bomber from Honolulu to Johnston Island.

If *Sonja Henie*, the skating movie queen, ever visits the Pacific theater of war, one of her most ardent greeters will undoubtedly be *Private Rynkofs* of the Marines, for Jean's best girl, *Shyrlie Martinson* of Hollywood, is Sonja's twin in everything but skating skill and serves as the film star's stand-in.

*A. J. Brown* has been named Pacific Coast representative of the *Whiting Corp.*, Harvey, Ill., with offices at 1151 So. Broadway, Los Angeles. Mr. Brown has supervision over sales and engineering activity of the Whiting products in California, Oregon and

# Crown Pick-up Unit



## ...MACHINE...

A UNIT TYPE TRANSFER CAPABLE OF  
HANDLING SEVERAL TANKS  
AT ONE TIME.

## ...USE...

FOR A SERIES OF OPERATIONS WHERE THE WORK  
MUST PASS THROUGH SEVERAL TANKS, AS  
THE CLEANING AND RINSING OPERA-  
TIONS, FOR A SEMI-AUTOMATIC  
PLATING TANK.

**CROWN RHEOSTAT & SUPPLY CO.**  
1910 MAYPOLE AVENUE : : : CHICAGO, ILLINOIS



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Bronze and Gilding  
Processed For  
Difficult Drawing  
Bright Finishes

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BRISTOL, CONNECTICUT**

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## OXYDYZENE

HIGHEST STRENGTH  
OXIDIZING AGENTS  
POSSIBLE TO PRODUCE

Sold in LUMP and LIQUID FORMS by Leading  
Plater Supply Houses  
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## Truly—Three Great Finishes!!

### CHROMIUM — UDYLITE — SHERARDIZING

For over a quarter of a century building and installing portable sherardizing furnaces and equipment; metal finishing and plating. We invite your inquiry.

**THE NATIONAL SHERARDIZING & MACHINE CO.**

Office & Factory

Hartford, Conn.

Foreign Representatives—Oliver Bros., Inc.  
417 Canal St., N. Y. City

## CHROMIUM PLATING SCREWS-RIVETS-WASHERS SMALL PARTS, ETC.

**THE CHROMIUM PROCESS CO.**  
Shelton, Conn.

Washington. The firm's aviation staff, directed by *H. B. Doll*, has been transferred from Hollywood to the South Broadway offices.

Headed by *J. Russell Kelly*, *Atomized Metals Co.* of San Francisco, well known for its work in metal spraying auto truck parts, is installing additional machinery for crankshaft grinding.

*International Business Machines Corp.* of Endicott, N. Y., has opened a branch plant at San Jose, Calif., and has transferred 28 skilled workers from the Endicott factory to form the backbone of a staff in the new California plant, which on November 1 numbered about 90.

The Los Angeles County Chamber of Commerce has issued its third analytical report on strategic materials since Pearl Harbor in the form of a complete survey of the war minerals situation in the Southwest. The data are presented in book form under the title "War Minerals—Metals." The study covers all pertinent information on production, marketing and various government aids. Strategic minerals covered in the report include aluminum, antimony, chromium, copper, iron, lead, magnesium, manganese, mercury, tungsten, zinc and various miscellaneous metals.

Formation of a pool of steel, copper and aluminum into which smaller war plants in Southern California may dip for these vital

metals without recourse to the slowing effects of red tape, was announced at Los Angeles on November 1 by *I. F. Dix*, W.P.B. priorities head.

Eligible to participate in the pool are firms annually ordering less than 150 tons of carbon steel, 40 tons of alloy steel and 8,000 lb. of copper-base alloy sheet and strip and related amounts of various alloys.

Some 7,000 plants are expected to benefit by the new order by drawing on national metal supplies apportioned to the region including California, Arizona, Nevada and

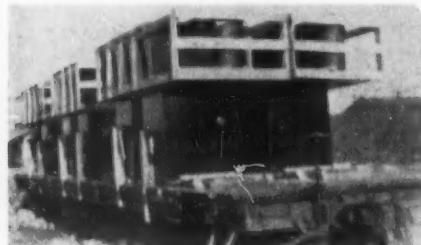


Southern Idaho through applications at Los Angeles and San Diego instead of Washington. Instead of applying four times a year for allocations, smaller firms will receive their share of the metals on an annual basis.

*Modern Research & Processing, Inc.*, capital stock \$10,000, has been incorporated at Los Angeles by *A. K. Schwartz* and *M. L. Nelson* of Los Angeles, and *M. C. Sinclair* of Inglewood, Calif.

New light weight tin cans, electrolytic in place of the old-style hot-dip, are reported to have resulted in considerable changes in the methods of handling canned goods in transit in California. The new cans, it is reported, will not withstand an amount of heating equal to the old type and are said to be more easily subject to denting. One angle in the situation is that shippers of canned goods have had to revise their ideas on high piling.

*Combined Metals Reduction Co.* has filed application with the War Production Board for consideration of a proposed zinc treatment plant in the Owens Valley's area of east-central California. The first operates zinc producers in the Pioche district of Nevada and in Utah and is developing the Miller zinc deposit east of Lone Pine, Calif. At present, the firm pointed out, most of the zinc produced in the Far West must be shipped to Kansas for refinement, a situation which would be relieved by construction of a treating plant in Owens Valley.



Complete ceramic-lined chrome plating tanks. Three carloads—18 tanks—recently shipped to one user.

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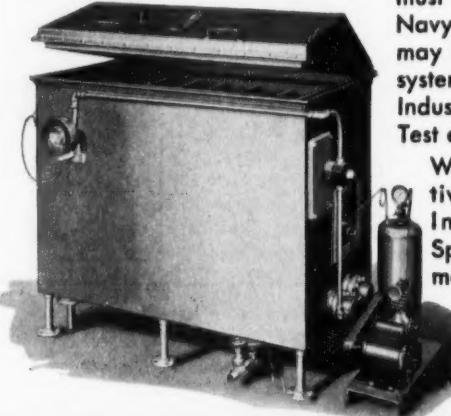
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## Business Items

*W. W. Davidson*, vice president of *Detrex Corporation*, Detroit 27, Mich., metal cleaning engineers, have announced the appointment of *Harry S. Tweedy* as manager of their field service division.

Mr. Tweedy has been chief inspector of production in all *Detrex* plants since December, 1940. Prior to that time he served for four years as a design engineer.

Until recently, Mr. Tweedy had been a member of the faculty of the University of Detroit and is a registered engineer. He taught engineering technique and mathematics in the university night school.

Born in Ireland, Mr. Tweedy was educated at Dublin University where he received his B.A., B.S.C., and H.Eng. degrees. During World War I, he was a Captain in the 3rd Royal Dublin Fusiliers and served with the British Expeditionary Forces from 1915-1919.

*Ralph M. Johnson* has been appointed general sales manager of grinding wheels and abrasive grain for the entire United States by *Norton Co.* He will make his headquarters at the Worcester plant but travel extensively. Mr. Johnson has been the company's western sales manager since 1939.

Mr. Johnson was graduated from Worcester Polytechnic Institute in 1915 with a B.S. in chemistry. Shortly after graduation he joined the *Norton Company* research staff, working first in the organic laboratory and then in the mechanical laboratory. Then he worked for five years in the sales engineering department, ending his work there as assistant sales engineer.

In 1922, he was placed in charge of the Connecticut sales territory with headquarters at the Hartford office. In 1928 he was made manager of the Philadelphia warehouse and sales district. He continued in that capacity until 1934 when he was brought back to Worcester as chief sales engineer, leaving that post to take charge of sales operations in the central and far western sections.

*W. F. Newberry* has been appointed sales manager of the industrial division of *Detrex Corp.*, Detroit, Mich., according to an announcement by *W. W. Davidson*, vice-president. *Detrex Corp.*, formerly known as *Detroit Rex Products Co.*, manufactures a line of metal cleaning equipment and materials.

Mr. Newberry started with *Detrex* in 1934 as sales and service engineer in the northeastern states, later serving as eastern region manager for several years. More recently he was south central region manager with headquarters at Dayton, O.

He brings to the main office in Detroit wide field experience in cleaning problems and applications, especially in the aircraft industry where fast, thorough cleaning is essential to war-winning production.

# CHROMIC Acid

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With two complete, independent plants at Jersey City and Baltimore, and its own supply of the basic raw material Chrome Ore from company owned and operated mines, Mutual is the world's foremost manufacturer of Chromic Acid.

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*R. A. Schoenfeld*, vice-president and sales manager of *Wheelco Instruments Co.*, Chicago, has announced several recent additions to the company's sales and service organization.

New England representation has been strengthened by appointment of the *Cochrane Steam Specialty Co.*, Boston, to serve with *George W. Hall*, the company's present representative. The Cochrane organization and Hall now serve Massachusetts, Rhode Island, Maine, New Hampshire, Vermont and parts of Connecticut east of the Connecticut River.

*C. L. Clark*, formerly attached to the company's Cleveland office, has been placed in charge of a western New York office in Buffalo. *Charles D. Mount* has been named sales and service representative for southern Ohio and northern Kentucky, making his headquarters in Cincinnati, while *H. E. Holling* has been appointed north-western Illinois representative with headquarters in Peoria.

*The Lang Company*, Salt Lake City, has been appointed sales and service representative in Utah, Idaho, Wyoming and Nevada.

*Dr. S. C. Ogburn, Jr.*, manager of the research and development department, *Pennsylvania Salt Manufacturing Co.*, Philadelphia, has announced the following recent additions to his staff:

*J. Grant-Mackay*, formerly with *Jefferson Island Salt Mining Co.*; *Francis E. Murphy*, formerly with *General Chemical Co.*; *Dr. Herbert E. Ricks*, formerly with *Gutham Radio Co.*; *W. C. Wolfe*, formerly with



"THAT'S PERSPIRATION, MRS. IAN BUTTERWORTH."

*Petroleum Chemicals, Inc.*; and *Alfred H. Pope*, formerly with *General Chemical Defense Corp.*

In addition to the above, several recent college graduates have been added to his staff, including:

*William K. Conn*, Harvard College; *James H. Koob*, LaSalle College; *Lester S. Verdelli*, Ursinus College; *Miss Anne M. Buchy*, Chestnut Hill College; and *Miss Evelyn C. Sisson*, Indiana University.

*Leonard T. Beale*, president of the *Pennsylvania Salt Manufacturing Co.*, announces

the purchase by that company of the famous Whitemarsh Hall, former residence of the late Edward T. Stotesbury, which is located just outside of Philadelphia. The purchase includes the residence and adjacent grounds. The building will be converted into a scientific research laboratory. Commenting upon the purchase, Mr. Beale said, "It is our intention to limit the use of this property to scientific institutional purposes solely. No manufacturing or commercial operations of any kind will be carried on in it. We plan to set up in this building a staff of about 75 chemists and their assistants to carry on scientific studies for use in our operations at our various plants."

*John B. Ross*, formerly with *Linde Air Products Co.* has been appointed to the west coast engineering office of *Handy & Harman*. Mr. Ross will serve west coast industries and shipyards in the capacity of brazing engineer in the application of the company's silver brazing alloys and other precious metal products.

Mr. Ross is a graduate of the University of California where he was employed for some time on advisory work. Following this, he went with a large western oil company and finally became associated with the gas consuming apparatus field which he has served since 1925. In his new appointment, Mr. Ross will make his headquarters at the Los Angeles office of *Handy & Harman* which serves, California, Washington and Oregon.

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W. D. MacDermid

*W. Douglas MacDermid, formerly vice president and sales manager of MacDermid, Inc., Waterbury, Conn., has gone into business for himself. The new company is called W. D. MacDermid Chemical Co., and is located in Bristol, Conn.*

*John C. Oberender is celebrating a gala month. Not only did the 25th of November mark the fortieth wedding anniversary of the Oberenders but on December 9th, he started his twenty-sixth year with Zapon Division, Atlas Powder Co., Stamford, Conn.*

*After 63 years of consecutive service Charles Buckingham has retired from the Seymour Manufacturing Co. where he became an employee three years after the company was organized. For 60 years Mr. Buckingham served as shipping clerk for this company.*

*During the first World War, Mr. Buckingham saw the conversion of the plant from manufacturing and distributing for peacetime uses thousands of pounds of nickel silver and phosphor bronze to the manufacture of millions of pounds of war materials such as brass cartridge discs, copper rotting bands and brass strip.*

*Again during World War II Mr. Buckingham saw his company change from the manufacture of peacetime products to war armament.*

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KEYSTONE EMERY MILLS, 4318 Paul St., Phila., Pa.

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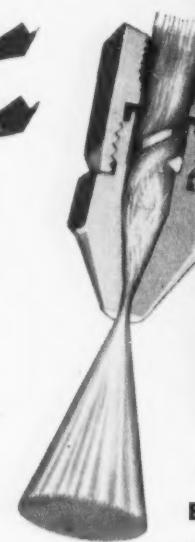
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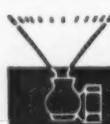
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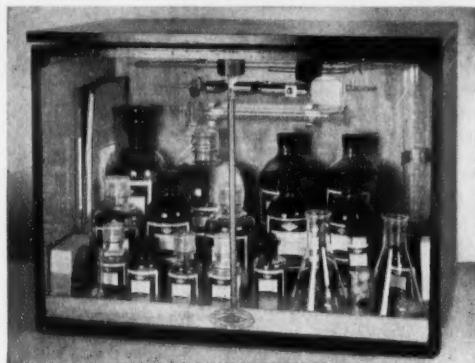


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**pH CONTROL**

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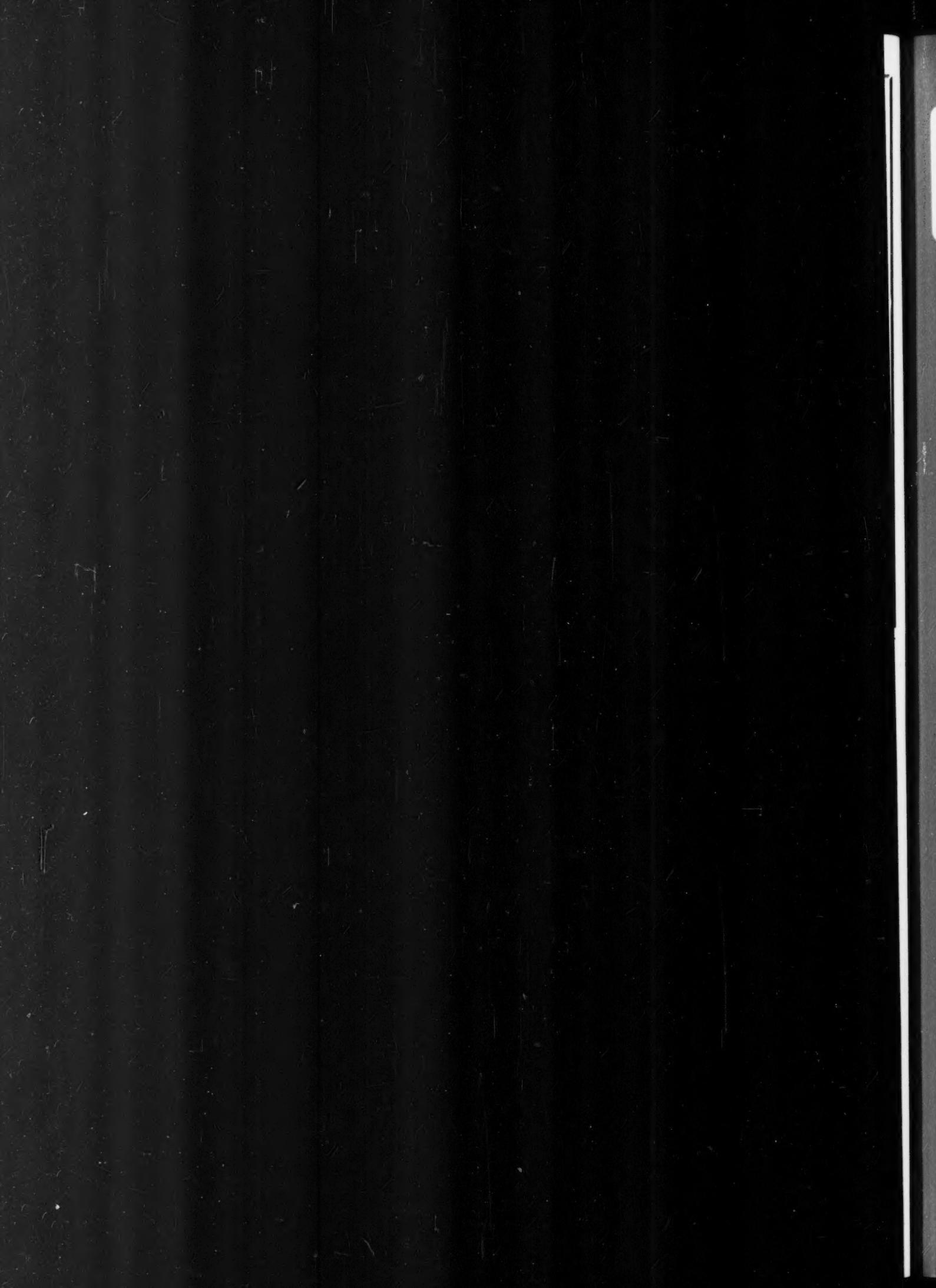
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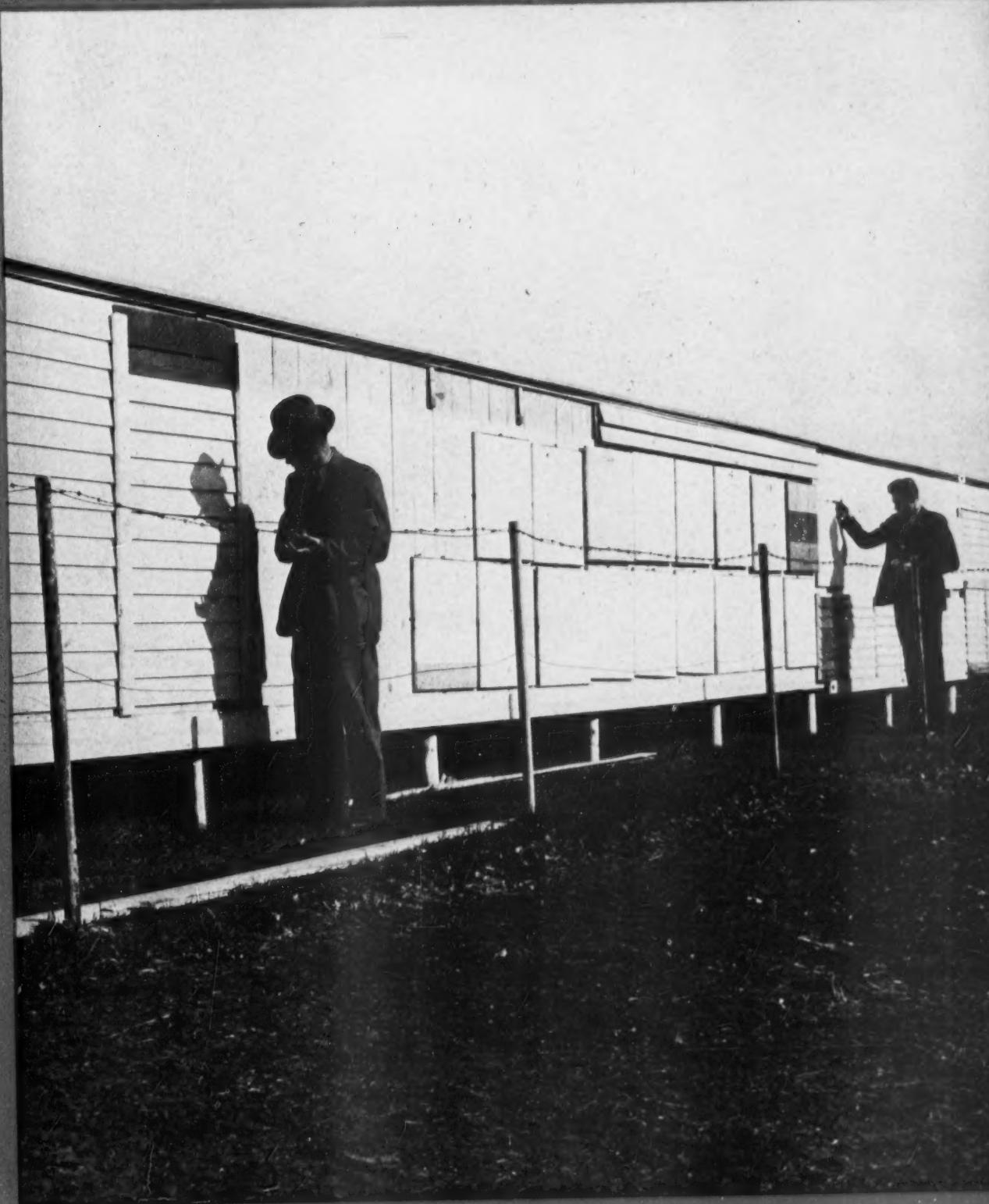




DECEMBER, 1943

# ORGANIC FINISHING

SECTION OF METAL FINISHING



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**ORGANIC FINISHING**  
**SECTION OF METAL FINISHING**  
**DECEMBER, 1943**

**Testing for Weather Resistance**

Much progress has been made in the finishing industry in the past few years. It must be admitted, however, that organic finishing is still not an exact science and it has not been possible to formulate general laws about finish behavior such as resistance to weathering. All of the factors influencing this characteristic of finishes are not known. Many of those which are known are not completely understood, particularly in their relationship to one another. Therefore, testing finishes for resistance to weathering must be done by practical experiment.

Any practical experiment must be made on a larger scale and, if anything, must be more carefully planned and executed than a purely scientific experiment if the results are to mean anything. This applies to finish testing in general and to testing for weather resistance in particular. If this fact is not recognized, not only may the time and effort spent be wasted but, more important, conclusions drawn from the results obtained may be incorrect with all that that implies.

In testing finishes for weather resistance it is necessary, therefore, to prepare test panels or samples very carefully, duplicating actual production finishing as closely as possible. It is necessary to use a sufficiently large number of these panels or sample pieces to eliminate the possibility of drawing false conclusions from test results due to minor variations in application, etc. Tests must be made for all of the conditions and combinations of weather which may be met in actual use. Frequent inspections during the progress of the tests and accurate recording and evaluation of results by a skilled observer are essential. Finally, each individual test must be checked at least once to assure correct data.

There is no royal road to testing finishes for weather resistance. Predictions can not be made on the basis of finishing material composition or gloss or thickness of the final film. A few panels exposed on a factory roof or at the sea shore or a salt spray or humidity test is not enough. Proper testing of finishes for resistance to weathering requires care, time and experience.

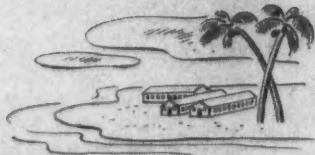
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or roller coating method. It dries quickly for handling and packing with a minimum of special equipment.

This is but one of the many finishing problems with which we can help you. Today, Egyptian service to you is definitely two way: 1—it covers the war products you are now making; 2—it covers the peace products you'll be making in the post war period to come.

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**EGYPTIAN**  
**SUPERIOR FINISHES**

# NEWS FROM WASHINGTON—

By George W. Grupp

METAL FINISHING'S Washington Correspondent

**Butyl Alcohol Sliding Scale Prices** Based on weighted average costs, a sliding scale of prices on butyl alcohol was established in the issuance of Amendment No. 10 to Maximum Price Regulation No. 37 on November 6, 1943. The maximum prices per pound, f.o.b. works, for sale by a producer are: Tank car lots \$0.495; drum carloads (drum included) \$0.505; ten or more drum lots (drums included) \$0.510; for 1 to 9 drum lots, (drums included) \$0.520, and for 1 to 5 gallon cans, (container included) \$0.570. To these prices, "for every increase or decrease of \$0.01 per pound in the computed average cost of butyl alcohol delivered at the works from a base average cost of \$0.15 per pound, the maximum prices for dibutyl sebacate set forth in paragraph (a) (the prices quoted above) shall be increased or decreased, as the case may be, by \$0.0055 per pound."

**Class B Product Allotments** Directive No. 36 to CMP Regulation No. 1, issued on November 5, 1943, provides that customers may make allotments to Class B product manufacturers under two conditions. These conditions are: (1) when a customer, who in good faith obtained an allotment or material to make a product himself, finds that for unforeseen events he has been prevented from doing so; (2) when a customer designs and engineers a product which it is his practice to subcontract for production in whole or in part and the contracting manufacturer is not able to foresee the requirements of materials for the whole or part of the product. But before the customer passes on his allotment he must first satisfy himself that his supplier has neither applied for nor received an allotment of materials to make the Class B product he is asking him to make.

**Drying Oil Restrictions Eased** Restrictions were eased on essential paints and varnishes for civilian requirements through the issuance of amended Food Distribution Order No. 42 on October 19, 1943. This order increased the amount of drying oils which may be used in paints, varnishes and lacquers from a previous 50 per cent to 60 per cent of the 1940-41 base. But in spite of the amended FDO-42, the Chemicals Division of the WPB intends to enforce Order M-332 until such time as the supply and demand of drying oils are more evenly balanced.

**Enamel Wire Naphtha** Enamel wire naphtha, a heavy fraction from solvent naphtha used in the manufacture of enamel for resistance and magnetic wire whose distribution is now controlled by specific directives, and the supplies of which have been frozen since September 29, 1943, may be placed under allocation by the War Production Board.

**Ethyl Alcohol at 18 Cents a Gallon** Representative John M. Coffee of Washington lifted his voice in Congress on November 8, 1943 for the purpose of registering a protest against what he called "outrageous bureaucratic muddling" in blocking the production of ethyl alcohol from pulp mill waste sulfite liquor. He cited as an illustration how the Puget Sound Pulp and Timber Company of Bellingham, Washington, on February 11, 1942 had offered to the War Production Board to make ethyl alcohol for 18 to 20 cents a gallon and that they have not up to the present been given the green light. He concluded his 15 minute speech with this comment: "The burden of my complaint is that by developing the production of alcohol from waste sulfite liquor, this country would have eliminated to a considerable extent the sugar shortage; would have furnished alcohol at less than one half that we have been paying for it; would have eliminated the use of about 1,000,000

tons of shipping or railroad transportation, and would have solved, in part at least, the difficult pollution problem in the pulp industry."

**Ethyl Alcohol West Coast Prices** In the issuance of Amendment No. 4 to Maximum Price Regulation 295, the Office of Price Administration made it clear that "current costs may be used as the basis for computing maximum prices of industrial alcohol produced by West Coast converted distilleries and sold to the Government."

**Glycerin Production Increase Expected In Southern Rhodesia** A new plant which recently began operations in Southern Rhodesia, expects to increase its production of glycerin from waste soap materials.

**Nyasaland's Tung Oil Production Increasing** Dispatches recently reached this country which revealed that Nyasaland's production of tung oil in 1942 was double that of 1941. The present tung-nut crop is expected to show a 130 per cent increase in 1943 over 1942.

**Paint Industry Progress** In the Presidential Room of the Hotel Statler, Washington, D. C., scores of new paint products and uses developed by the paint industry of the United States for civilian and war purposes, were displayed during the latter part of October. This "Paint at War" exhibit, sponsored by the National Paint, Varnish and Lacquer Association, consisted of 15 huge illuminated panels which depicted the paint industry's efforts to help win the war. Thus far, the outstanding achievements of the industry are (1) the development of a preservative film with an average tolerance of one ten-thousandth of an inch which made possible the conversion from brass to steel shell cases; (2) the development for tanks and other military equipment of a lusterless, olive drab enamel with low specular reflection, which scatters light and thus eliminates the risk of revealing glints to the enemy; (3) the development of bomb coatings which are able to withstand all possible exposures including immersion for 18 hours in cold water without fading, softening, checking or changing color or acquiring any sheen or gloss which might attract the attention of enemy airmen; (4) the development of three separate types of de-icing compounds which help to prevent the formation of ice on the plane's wings at high altitudes; (5) the development of a new ship bottom paint, which conserves fuel consumption, increases speed and materially reduces the number of lay-overs for ship bottom cleaning; (6) the development of a special food can coating which blends into the terrain to prevent enemy aerial observers from easily tracing our troops by trails of food cans, and (7) the development of new phosphorescent and fluorescent paints which are especially adapted for high speed infra-red baking of acid- and corrosion-proof coatings for certain metal surfaces. The exhibit revealed that paint protects such articles of a soldier's equipment as his helmet, food ration container, cartridges, shoe eyelets, hand grenades, rifles and mess kit. It also showed how all military hardware is given a special enamel protective coating of paint.

**The Term "Procuring Claimant Agencies" Clarified** The term "Procuring Claimant Agencies" was clarified by the WPB through the issuance of Interpretation No. 20 to CMP Regulation No. 1 on October 29, 1943. The Procuring Claimant Agencies are said to be (1) the Aircraft Resources Control Office, (2) the Maritime Commission, (3) the Office of Lend-Lease Administration, (4) the Navy Department, and (5) the War Department (including ordnance).

# *Cut* FINISHING PLANT *Rejects*

WITH A

## G-W INFRA-RED SYSTEM

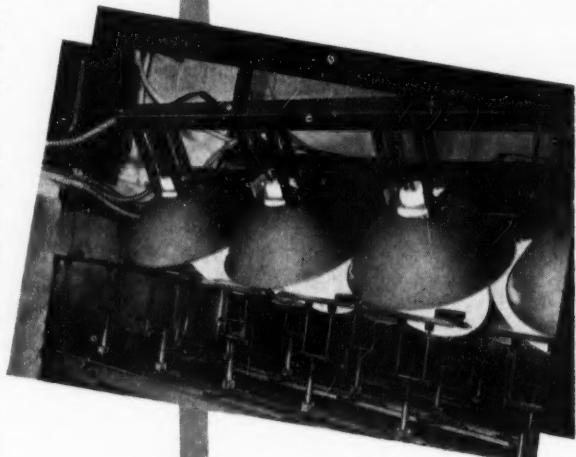
**T**HREE'S more resistance to chipping, scratching and smudging in the dry, tough finishes obtained with a G-W Infra-Red System. In addition it gives better control over all baking and drying steps—two reasons why a G-W System lessens work spoilage in the finishing process. A recent installation slashed rejects by 30%.

Six other advantages make radiant heat drying worth looking into. It triples drying production, saves up to half of your floor space, lowers power and fuel costs up to 75%, calls for less equipment investment, less overhead, and less manpower. Of course, in order to deliver these economies an Infra-Red System must be designed for your plant and synchronized to its operations—a job that's ably done by experienced Gifford-Wood engineers. They'll handle all design and production details, install a job under a performance guarantee.

But first find out whether the process will save time and money in your finishing room. Have a Gifford-Wood representative look over your plant, and submit a complete engineering report. Or get preliminary data from Bulletin 0-150—yours promptly on request.



*Spraying parts on moving NI-R Conveyor.*



*Close-up view showing finished parts under baking lamps where NI-R conveyor emerges from the spray room.*

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HEADQUARTERS FOR INFRA-RED BAKING AND DRYING

4784

METAL FINISHING, December, 1943

# Drying Equipment

By JOHN E. HYLER

*Peoria, Illinois*

WHETHER the drying problem in a given plant has to do with drying cleaned metal parts just prior to finishing or the drying of finishing materials after application, methods used will overlap in some degree and, therefore, may be considered together.

## **Sawdust Drying**

The use of sawdust in tumbling barrels is a time-honored method for drying small metal parts and, while many have tried to get away from the use of sawdust for this purpose and some have succeeded to their own satisfaction, it is a fact that many prefer the sawdust method to any other that has been developed.

One development has gone a long way toward keeping sawdust drying in favor, namely, the use of steam-heated barrels in connection with the sawdust. In one barrel of the oblique tilting type, which can be tilted down to discharge the load by gravity into a pan or tote box on the floor, the tumbling chamber of the barrel is jacketed and the machine is provided with a hollow shaft and with pipes for the circulation of steam. The sawdust included with the charge or parts being tumbled is kept hot and dry and the moisture is almost instantly released to the atmosphere. Thus, the sawdust is kept in a hard and sharp condition for a much greater length of time. Since the barrel can be tilted to the angle found best for each type of work, and since it can be emptied and re-loaded readily while revolving, there is no lost time.

Fanning mills, by means of which the sawdust is separated from a charge of nails, screws, pins, small hardware or like work, are often used in conjunction with sawdust barrels. The

fanning mill receives the mixed charge that has been tumbled dry. The charge is agitated in a hopper to gravitate the heavier pieces to the bottom and is fed in a thin stream down a chute where it encounters a very strong current of air. The air current allows the heavy parts to pass but blows the sawdust, together with any dirt and foreign matter, upward into a bin. Separation in a fanning mill of this kind is a continuous process and means are provided for varying the strength of the air current in accordance with the weight of the parts being handled. The air current, produced by a fan, is varied by opening or closing small dampers at the end of the fan chamber.

## **Drying Ovens**

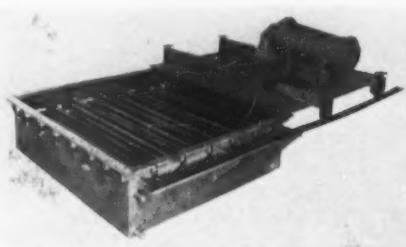
There are many metal products which are dried best in a drying oven. This is especially true of products that are of relatively large size on the one hand and relatively light in weight on the other. Waste baskets made of woven wire or of sheet metal that have just been cleaned or finished are an example. Firms which specialize in

the manufacture of drying ovens usually make the oven proper in the form of a sheet metal enclosure and build an oven to the specific requirements of any given plant. Such ovens range all the way from small box models to large conveyor types.

The heating of drying ovens and other types of finishing ovens is more simple than it used to be. Oven manufacturers have made a special study of heating, and have produced units specifically designed for use with ovens. One modern heater is an oil-fired recirculating type. This heater has made it possible to design new ovens that have a high degree of efficiency, and is also used to great advantage in the modernization of old ovens. The unit is externally mounted. The oil and air are scientifically premixed in the correct proportions before entering the combustion chamber and as a result there is a clean flame with no trouble from soot or carbon deposits.

## **Centrifugal Dryers**

Dryers of centrifugal type for small metal parts have been coming into increasing use of late years and there are now several concerns prepared to furnish them. The mechanical principle involved in centrifuge drying is that of whirling the parts in a basket at a sufficiently high speed so that the moisture, or at least the bulk of it, is thrown off. One efficient centrifugal dryer may be had either with or without a heater. Another centrifugal dryer has a motor driven basket. This machine is equipped with automatic brakes. There is one type of centrifugal dryer, made entirely of steel and of electrically welded construction, that may be used not only for drying all types of



Unit for drying small lacquered items held in trays, shown in open position for removing and inserting work. This equipment recovers the solvent.

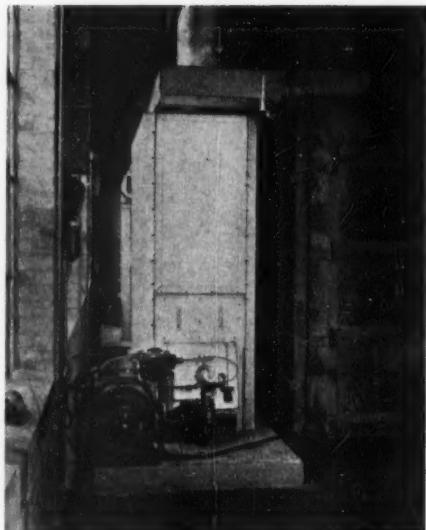
—Photograph courtesy L. O. Koven & Brother, Inc., Jersey City, N. J.

work but also for the lacquering of small parts if desired. The basket on this unit rotates at 625 r.p.m.

Some centrifugal dryers for small metal parts are quite highly developed. One firm recognizes the fact that, while centrifugal force provides the fastest and most economical means for disposing of surplus moisture from parts being dried, heat is best for removing the last traces of moisture. Accordingly, they have designed and built a centrifugal dryer equipped with a compact steam-heated unit for circulating hot air through the load to complete the drying operation. This machine is fitted with a removable basket. By using two baskets, the machine may be kept in practically continuous operation, one basket in the machine with a charge of parts in the process of being dried while the other basket is being taken to the location where the parts are to be used or stored, unloaded, and then loaded with a fresh charge of parts to be dried. An additional advantage of this particular machine is that the drying basket is equipped with partitions which allow the processing of different kinds of parts at the same time without getting them mixed.

#### Air Blasts for Drying

In some drying units for small metal parts, such as fasteners, small stamp-



Oil fired indirect air heater used to modernize old type ovens keeps the products of combustion out of the oven work chamber, insuring clean, high quality finishes.

—Photograph courtesy Despatch Oven Co., Minneapolis, Minn.

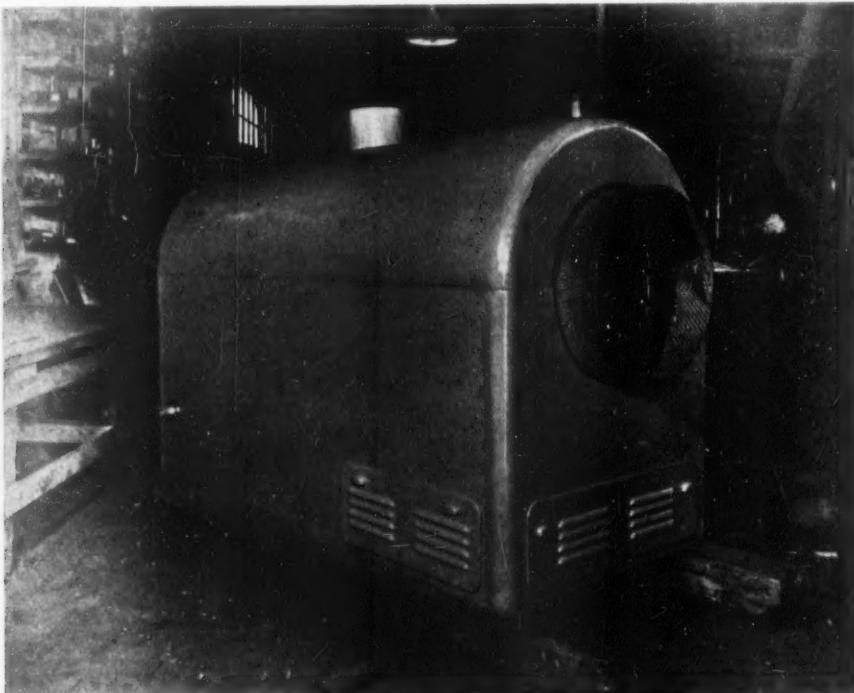
ings, cabinet hardware, etc., the drying process is hastened by using an air blast rather than a mild circulation of heated air. In one unit using an air blast, a charge of parts is dried thoroughly in two or three minutes. An efficient electric heater is combined with a powerful blower in order to force hot blasts of air through and around the parts being dried.

It should be remembered that in some cases the actual velocity of a cold air blast is valuable in the removal of surplus moisture. Some use is made of this fact in the case of a unit that was developed for drying tin plated evaporator boxes for refrigerators and similar pieces. Both cold and hot blasts are used for drying in this machine, there being two compartments. In the first compartment, the work encounters the cold air blasts which strip off the large globules of moisture, removing 85 to 95 percent of them. Then, as the parts are presented to the hot air blasts in the second compartment, the balance of the moisture is easily evaporated. The machine has a reputation for drying the work without leaving any spots on the surfaces.

Directly opposed to air blast drying is the method of drying metal parts in a vacuum. The outstanding value of the method is the removal of residual moisture from inaccessible crevices and holes. The method has been used with success for drying copper wire that has been bright annealed and then pickled and washed. It has also been used in drying parts of electrical circuit breakers. The material to be dried by this process is placed in a special vacuum chamber from which oxygen and air have been removed. The materials are then heated, and the heat stored in the metal is used to remove all moisture. It is a highly useful process in certain cases.

Admittedly, circumstances often alter cases in the drying of metal parts in a given factory, and where circumstances are out of the ordinary it is best to have a drying equipment specialist go over the ground and make recommendations, especially if large production is involved. There are drum types of dryers. There are belt conveyor models. There are monorail style drying units. And there are drying equipment specialists that make all these different forms of equipment and engineer them to the individual plant. It is difficult to find the problem for which there is not an adequate answer where mechanical handling is involved in connection with the drying.

Have you ever heard of a piece of drying equipment which would dry the lacquer coating on small lacquered workpieces and recover the solvent during the drying operation? The process involves the use of heated oil. There is a tank which holds steam coils



Continuous sawdust dryer. The sawdust, separated from the parts in the screen shown on the discharge end, returns to the front end of the machine. The dry parts are propelled out of the machine by the worms.

—Photo courtesy Howard Engineering & Manufacturing Co., Cincinnati, O.

to provide the heat and also holds oil to distribute the heat from the coils. There are six trays incorporated in the device which are filled with pieces that have been lacquered. There is a wheel-mounted cover which is run into place over the tank after the trays have been placed. On this cover is a condenser which converts the rising solvent vapor into a liquid and delivers it to a reclamation point so that it can be used over again. For best results, it is necessary to control carefully the temperature of the oil in the tank. This is taken care of by thermostatic control.

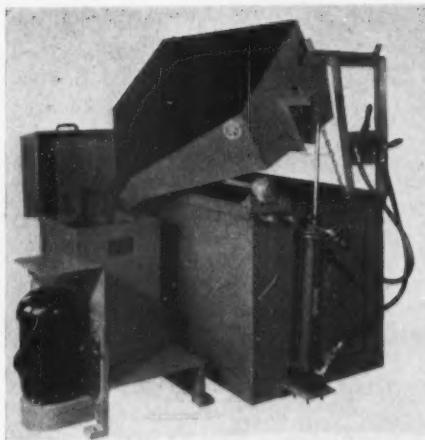
### Electrical Drying

One of the latest developments in the finish drying field is the use of electric lamps. Rapid availability of heat and convenience are factors in favor of this type of heat for finish drying. Heat is available at the flip of a switch. It is interesting to note that this field is of such importance that some of the largest manufacturers of electric lamps in the country are providing radiant heat drying lamps.

Firms specializing in infra-red lamps for drying applications have made great strides in the development of different lamps for different purposes. In one case a company is making infra-red lamps for use with gold-plated reflectors and is also making lamps with their own sealed-in reflectors. Obviously, there will be cases where it will be advantageous to have a lamp that will do its own reflecting.

One company provides a fine line of infra-red drying lamps of the carbon filament type and also a very ingenious portable drying unit in which there is an assembly of infra-red lamps mounted in three rows. There are five lamps in the center row, and four in each of the two outer rows. The arrangement is such that the lamp assembly can be tilted on its horizontal axis to suit any drying problem that may arise. The assembly can also be adjusted vertically to any point from 12 to 96 inches above the floor. Each row of lamps has an individual switch. Four, five or nine lamps, or the entire thirteen can be used at any one time at the option of the user. The entire unit is mounted on casters so that it can be pushed readily to any point in the shop.

In the case of large production a continuous conveyor traversing a tunnel in which the lamps are arranged has been found best. One firm which



Centrifugal dryer for small metal parts with 12 x 12 basket and automatic brakes receiving materials from rinse tank. The work is dropped into the chute on its "down" position. The air valve shown is then turned on, operating the air cylinder piston, which lifts the chute. Chute automatically tilts and transfers parts into the dryer.

—Photograph courtesy Crown Rheostat & Supply Co., Chicago 12, Ill.

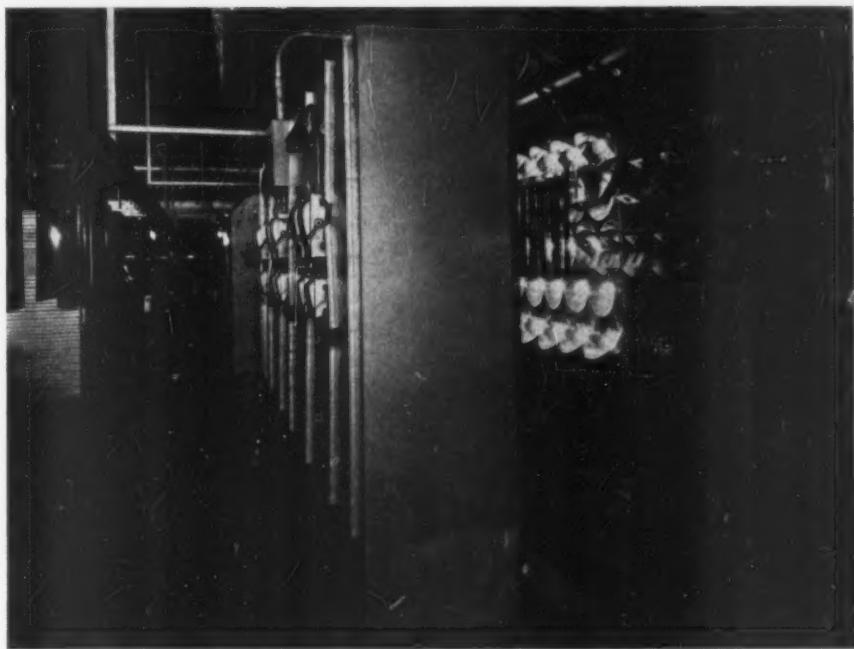
has made various installations of this kind cites a case in which a tunnel equipped with a continuous conveyor and 180 lamps of 250 watts each reduced drying time from 50 to 5 minutes. It is claimed that the cost of the equipment was returned in one year by operating economies. This is certainly a matter of interest to plants in which finish drying has been the bottleneck of production.

It is interesting to know that in arranging infra-red lamps in banks for

drying tunnels and similar set-ups, one of the manufacturers of infra-red drying equipment puts up these lamps in so-called strip mounting, a strip being six lamps arranged in a straight row on an individual mounting. By combining these strips it is a simple matter to arrange a bank of lamps for practically any purpose.

As a final word, one interesting phase on electrical drying has come to my attention. It is a method devised for drying the paint on either pipe or on steel sheet. Galvanized piping and sheet metal are more difficult to obtain due to priority on galvanized finishes and as a consequence much more of these products are being painted for protection. The electric heater used for drying the finish is really a transformer unit from an electric metal heater. It is equipped with leads at the ends of which are tapered copper plugs for use on pipe lengths. When used for drying paint on sheet steel, clamps are provided at the ends of the leads instead of the tapered copper plugs. The leads are attached and the current is allowed to pass for a length of time sufficient to bring the temperature of the metal to a given point, after which the heat in the metal finishes the drying job.

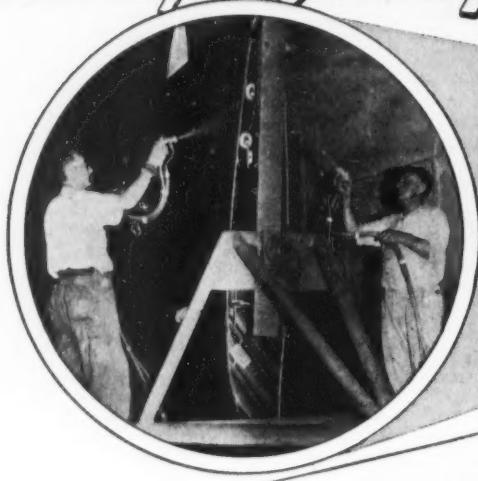
While there are other drying applications that might be cited, it is believed that the ones mentioned are of most interest to the finishing industry.



Tunnel of infra-red lamps for baking synthetic finishes. The same equipment can be used for drying metal parts after washing preparatory to finishing.

—Photograph courtesy Fostoria Pressed Steel Corp., Fostoria, O.

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## FINISHING FACTS



There are factors to strive for and things to guard against in the elimination of rejects, a few of which are listed below.

1. Settling
2. Skinning
3. Color
4. Lifting
5. Drying time
6. Texture
7. Chalking
8. Baking time
9. Baking temperature

10. Resistance to various chemicals
11. Flexibility
12. Viscosity or mobility
13. Color composition
14. Hardness or toughness
15. Blackness of black finishes

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# Radiant Gas Heat in Baking, Curing and Drying Operations

By CARL P. MANN

*Manager, Drying Division, The Selas Company, Philadelphia, Pa.*

**P**ROBABLY the most significant progress that has been made in recent years in the industrial application of heat to baking, curing and drying operations has been in the field of radiant heat and it is of more than passing interest to note that this form of energy, which was probably the very first form of heat application used by primitive man, should have been the latest to have given up its secrets to man's research. Primitive man, of course, did not know that he was using radiant heat. He knew only that when morning came he could crawl out of the damp cave in which he had spent the night and dry and warm himself in the welcome rays of the sun. Even today, as we are slowly coming into possession of more of the secrets of radiant energy, it seems apparent that we have but made a beginning in this vast field of heat application.

It was not until about the year 1800 that Sir William Herschel brought to the attention of the world the existence of radiations outside the limits of the visible spectrum by demonstrating that a thermometer placed at the red end of the spectrum showed a higher temperature than when placed at the blue end and also that the temperature increased as the thermometer was moved beyond the visible rays of the red end. That discovery marked the beginning of our modern knowledge of the electro-magnetic spectrum which covers the band from electric waves, with a long wave length of the order of 5000 miles, through the successive wave bands of radio, far and near infra-red rays, visible light rays (the narrowest wave band), ultra violet rays, X-rays, gamma rays, and the cosmic rays of a short wave length of the order of one hundred millionth of an inch.

Today, radiant energy, for the types

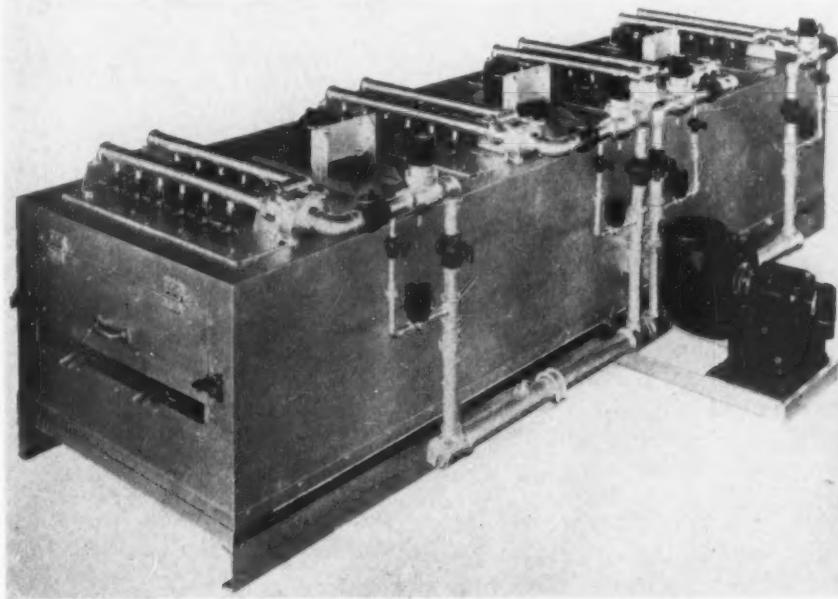
of application within the scope of this paper, is being produced both by the infra red lamp (in which the lamp filament is heated to incandescence by electricity and the resultant rays directed by suitable reflectors) and by the radiant gas burner (in which a gas flame is directed along a ceramic surface which, by virtue of its insulating qualities, becomes incandescent thereby converting more of the heat of combustion of the gas into radiant energy and making it available for further use). In both cases the incandescence is incidental. Infra-red rays are invisible but practical production of infra-red rays always includes some of the visible wave band.

The gas used for radiant gas combustion may be any of the commercial forms (natural gas, manufactured gas, mixed gas or liquefied petroleum gases) but the burners used must be designed for the particular type of gas as well as for the particular application. The design of a radiant burner also includes the formulation and manufacture of special ceramic materi-

als and their shaping and forming. Several standard forms have already been developed which can be adapted to wide classes of application but modifications and changes are constantly being made as new applications and special problems are presented.

Radiant energy possesses certain specific characteristics which are constantly being studied. One of these is that radiant energy is inherently directional and every application of radiant heat must be studied from this viewpoint. Again, the efficiency of radiant heat application is greatly affected by the absorption factor of the work under process. This means that the efficiency of radiant heat transfer is affected by the color and polish of the work pieces. White and highly polished surfaces reflect radiant rays. Black and unpolished surfaces absorb them. Other colors (yellow, red, blue, etc.) fall between.

Radiant heat responds very readily and rapidly to control due to the fact that electromagnetic rays travel with the speed of light. Response to con-



Radiant roof oven (48 ceramic burners) for baking top-side coatings and impregnations on flat work carried on chain conveyor. Four zones of control.

*(Address delivered before American Electroplaters' Society, 31st Annual Convention, Buffalo, N. Y.)*

trol, therefore, is just as rapid as control can be applied to the source of incandescence.

The transfer of radiant heat is very markedly affected by the distance between the source of heat and the work piece. The shorter the distance between the two, the more effective the heat transfer. This fact may be employed in control.

### Possibilities and Limitations

The above mentioned characteristics immediately point out some of the advantages of, as well as some of the limitations to, the use of radiant energy as compared with other forms of heat transfer, particularly convection heating.

Considering first that radiant heat is directional, it is immediately apparent that the radiant sources must be so placed that their rays are directed toward the work in process. This frequently presents a major problem because the work piece may be of such an irregular shape (or, in a succession of work pieces, each may be so located relative to the other) that shadows are thrown on parts of the work pieces. Also, it is frequently necessary to use a single oven for several different kinds and shapes of work pieces, which further complicates the problem because radiant sources so placed that they are effective for one work piece may not be satisfactory for another. This situation may be met by routing work pieces through the oven in batches, each batch carrying pieces all alike, and then arranging the radiant sources so that certain groupings will be used for certain pieces and other groupings for other pieces. The general trend, however, is to design an oven for a particular work piece.

This directional quality of radiant burners, however, may sometimes be used to great advantage to give "spot" heating, a result that cannot be readily attained with convection heating.

While it is generally believed that the shape of the work piece does not influence the design of a convection oven (except as to size), actually, the direction of the air flow must be considered with relation to the form of the work if greatest efficiency is to be obtained.

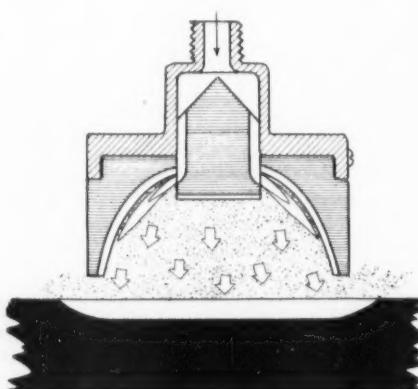
In curing finishes where dripping occurs, or where vapors released from

the finish tend to coat lenses or reflectors, radiant lamp sources are limited in their location so as to prevent loss in efficiency from these causes or provision must be made for frequent cleaning.

In convection heating, the color of finishing materials has no effect on the heat absorption factor. However, evidence collected to date seems to indicate that the greater the percentage of infra-red rays in a radiant source, the greater the effect of various colors on the heat absorption factor. This fact presents a problem where pieces coated with several colors are processed in the same radiant oven. It has been observed, for instance, in the simultaneous drying of many printed colors on paper using radiant burner ovens that, under certain conditions, black may absorb sufficient heat to absorb that part of the paper on which it lies, while yellow may not completely dry. Modification of finishes and printing

and the heat source is of great importance in using radiant heat. In curing synthetic finishes, an increase in this distance from 6" to 10" will extend the curing time as much as 500%, depending somewhat on the type of finish being used. In applying radiant heat, therefore, the rays must strike all finished surfaces from approximately the same distance. This same principle also holds true in baking and drying operations where no finish is involved. In utilizing convection heating equipment, however, this problem does not arise.

One important fact to be kept in mind, whether considering radiant or convection heating, is that the work piece itself must be heated up before a finish curing process can be completed. This is frequently overlooked or disregarded in planning the use of radiant heat but actual tests demonstrate the fact conclusively. A further interesting observation is that the shorter the curing time of a piece, the greater is the cure-retarding effect of increasing the weight of a piece, for a given external area. For instance, doubling the weight of a piece which has a curing time of two minutes will increase its curing time 59%, while doubling the weight of a piece which has a curing time of six minutes will increase its curing time only 32%.



The radiant gas burner projects heat BOTH by radiation (indicated by arrows) from incandescent ceramic surfaces, AND by hot combustion gas convection (indicated by stippled tone). Flame is directed ALONG (not AT) ceramic surface.

inks is one expedient for meeting this situation. Slowing down the process is another. Where pieces of like colors can be segregated, the work may be split so as to process like colors at the same time.

As for the nature of the base surface upon which finishes are applied, 20% more time is required with radiant heat to cure a finish on a highly polished surface than on an unpolished surface.

The distance between the work piece

If we consider the rate of production per unit of floor space, the convection oven will have the highest capacity, and the infra-red lamp the lowest. If, however, the work in process is such that the products of combustion of radiant gas burners can be allowed to combine with their radiant heat output, then the production rate of this combination will be the highest of all.

In general, convection heating ovens require a heating up time ranging from 15 minutes to 30 minutes, whereas infra-red lamp and radiant gas burner installations are ready for operation practically immediately after starting. Furthermore, in curing finishes, the convection oven requires an additional regulated preheat period of about one minute for the work piece to avoid damage to the finish by sudden contact with hot air. This preheating is generally accomplished by a planned exchange of heat from the hot cured pieces at the discharge end to the cool entering pieces at the feed end.

In both convection and radiant gas burner installations, the air and burner temperatures may be widely varied with corresponding permissible changes in oven design and consequent performance. In infra-red lamp installations, the wattage and number of lamps can be varied but baking temperatures in excess of 600° F. are not practical, for the present at least. This fact eliminates lamp installations from consideration in certain processes, such as vitreous enamel and high temperature reacting baking, both of which are exceptionally well suited to radiant gas burners.

From the standpoint of cost of equipment, the infra-red lamp is the cheapest, the radiant gas burner next and the convection oven the most expensive.

The final selection of a heating medium for any process will depend upon the economic considerations of the problem as well as the physical aspects and the performance data outlined above. Furthermore, this selection can be made only after the specific production requirements of the user have been fully analyzed in the light of these data.

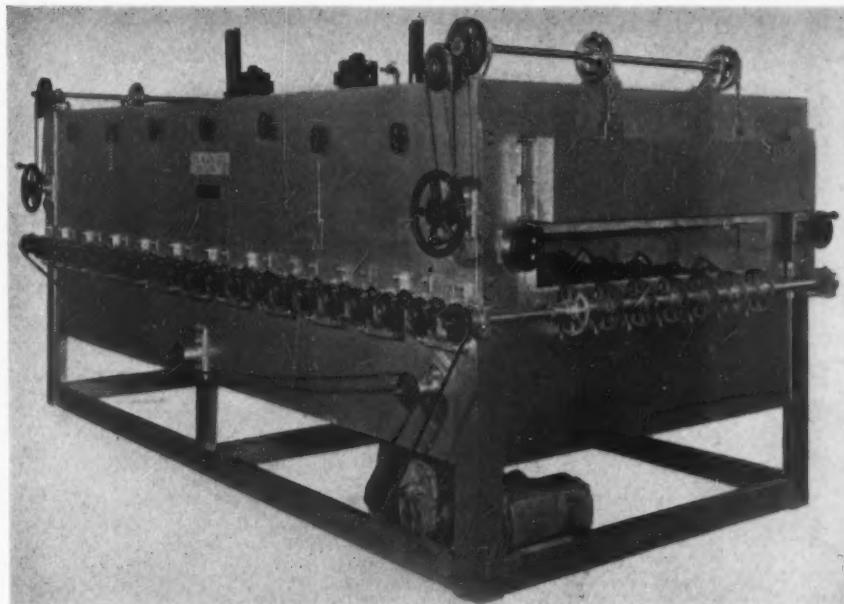
### Typical Installations

Out of many hundred installations already using radiant gas burners, we might well comment upon a few specific but representative cases, illustrating the surprising diversity of fields of application.

Two installations representative of the field of the curing of synthetic finishes are: the curing of sprayed automobile wheels where straight line production was maintained by rolling the wheels between opposed walls of radiant gas burners, and the continuous belt curing of the finish on brilliantly colored cosmetic containers under a radiant roof.

Radiant gas burner ovens for drying lithographed finishes on metal have reduced the length of these ovens from 60 feet to eight feet, which, of course, represents a truly significant saving in material and space.

Radiant gas burners have opened new possibilities in the treating of certain building materials and storage battery paste.



Radiant roof oven for drying lithographed metals. Oven length reduced 7½ times over former equipment. Note live-disc hearth for minimum contact with work.

Plaster molds used in the fine china industry, which formerly required 24 hours for drying, can now be dried in one hour.

A few years ago, the nationally circulated popular magazines were printed in web presses at speeds of about 350 feet per minute and the quality of this printing left much to be desired due to the fact that printing on one side of the sheet was smeared when the other side was being printed, or else the ink was applied very lightly. Almost overnight, through radiant gas burner dryers and the development of a new ink, printing speeds were nearly doubled with an attendant higher quality of printing. As a result of this development, new presses were designed so that today high fidelity printing is produced at speeds in excess of 1000 feet per minute. When you realize that in order to accomplish this, the web of paper actually travels through two radiant gas burner furnaces and this web may be stopped at any time, it may be appreciated how important is the matter of control.

Another very interesting application of radiant gas heat is in the sealing of paper milk bottles. Formerly the heating apparatus for softening the adhesive was bulky, temperature control was sluggish and difficulties were experienced in directing the heat on the adhesive only. By developing a spec-

ial radiant burner, the heat was directed only where it was wanted, gas consumption was reduced by nearly 90% and the equipment was compact.

As might have been expected, the radiant gas burner has been in use over an extended period in the baking of food. The accurate control, uniform temperature distribution and surface effects of radiant heat have produced superior cracker products.

In the textile industry, radiant gas burners are just on the threshold of great development. A similar situation exists in this industry as when a start was made in the printing industry in that installations to date have been made in conjunction with existing equipment such as loop dryers, dry cans and carbonizers, to increase output and improve the quality of the finished product. High temperature curing is necessary in the application of various water repellent, mildew-proof and crease-resistant finishes and the high temperatures obtained with radiant gas burners serve this purpose excellently. Radiant gas burners are particularly advantageous in curing and aging operations where textiles have been treated with chemicals which must be subjected to temperatures of 400° F. or more to complete the chemical reaction.

In the photo engraving industry, radiant gas burners have found a par-

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ticular application in fusing the Dragons-blood used in etching plates. The practice has been to apply the heat from the bottom, which means that it was necessary for the heat to be conducted through the whole metal of the plate. With radiant heat, however, the heat is directed on the face of the plate, thereby fusing the Dragons-blood in less time with less expenditure of heat and without danger of distorting the plate due to excessive heat.

Radiant gas burners have been found particularly effective in setting the coating on the inside of fluorescent

lamps. The radiant heat is transmitted through the transparent glass of the tube to bake the coating on the inside. The temperature of the oven in this operation is as high as 1400° F., which is within 10° F. of the glass softening temperature. Here again, the accuracy of control is clearly demonstrated.

One of the most recent applications of radiant gas burners in the steel industry, brought about by the necessity of conserving tin, has been the development of a new method of tin plating. This new procedure consists in electro-depositing tin on sheet metal

strip, subsequently heat-flowing the tin in order to seal the pores of the tin deposit to obtain a bright smooth surface for better printing, and for fusing the tin to the sheet metal. This new method affords protection to the base metal comparable to the heavy dip process formerly used at a saving of two-thirds of the tin. Here, again, radiant gas burners find an especially advantageous application because of their extremely high rate of heat transfer. Even at this early date, metal strip speeds in excess of 300 feet per minute have been attained.

The rapid development of the use of radiant gas burners naturally leads one to speculate on the future possibilities of this form of heat application. Tremendous strides are currently being made in the realms of chemistry and plastics and radiant heat, which is just beginning to enter these industries, will undeniably find an ever increasing field of application in both. The food industry offers very inviting and interesting possibilities in dehydration, for which the radiant burner would seem to be ideally suited.

As mentioned before, up to the present time in the textile industry, radiant burners have in most cases been applied to existing equipment. With the attendant increase in efficiency, improvement in quality and development of new textile processes, new equipment will be designed incorporating the radiant burners and then further development must surely follow.

The steel and ceramic and china industries are making great advances both in economy of operation and quality of product by the use of increased furnace and kiln temperatures, uniform distribution and accuracy of control. Today, radiant gas fired heat treating furnaces and china firing kilns are being operated at temperatures in the order of 2400° F. with a temperature distribution throughout the working space of plus or minus 5° F.

At the present moment, the brightest future in processing appears to be opening up to methods which permit more rapid heat transfer, reduction in space for equipment, more precision in control and a reduction in capital investment in equipment. All of these requirements promise ever widening usefulness for radiant gas burners.

# Patent Abstracts

## Paint Brush

U. S. Pat. 2,326,879. S. P. Neuhausen, Aug. 17, 1943. A brush comprising three elongated bristle units each having a ferrule at one end provided with elongated engageable members on the sides thereof, and a holder for receiving the units in side-by-side relation and provided with retaining means for engaging said members of two lateral units and having means for effecting the disposition of the intermediate unit in a position wherein the engageable members thereof are engaged by the said members on the adjacent sides of the lateral units.

## Lacquer

U. S. Pat. 2,326,992. F. J. Bellac, Aug. 17, 1943. A lacquer for finishing artificial leather products which contain a textile base material and a pyroxylin-containing base coating, said lacquer consisting of a cellulose nitrate which is soluble in ethyl alcohol, is dissolved in a mixture of ethyl alcohol with toluene, xylene, and butyl alcohol; and a plasticizer selected from the group consisting of blown rapeseed oil and blown castor oil, said lacquer being substantially inert to said base coating.

## Paint Remover

U. S. Pat. 2,327,701. C. Ellis, C. Ellis, Jr. and B. Ellis, assignors to Chadeloid Chem. Co., Aug. 24, 1943. A finish remover composition, substantially devoid of suspended inorganic substances insoluble therein, and adapted for softening old paint and varnish film preparatory to removal thereof, which remover comprises at least one volatile solvent selected from the group consisting of benzene, toluene, acetone, methyl ethyl ketone, methylene chloride, ethylene chloride, carbon tetrachloride, methyl alcohol, ethyl alcohol and ethyl acetate; and a solid substituted paraffin selected from the group consisting of solid nitrated paraffin wax and solid halogenated paraffin wax, solid nitrated scale wax, solid halogenated scale wax, solid nitrated sweater oil, solid halogenated sweater oil, solid nitrated heavy viscous liquid paraffin and solid halogenated heavy viscous liquid paraffins, the proportion of said solid substituted paraffin being not substantially less than 1% and being sufficient to form an evaporation-retarding film on the surface of said composition on exposure to the atmosphere, whereby further evaporation of the volatile solvent is retarded.

## Paint Brush

U. S. Pat. 2,329,534. E. L. Hawkins, Sept. 14, 1943. A paint brush comprising a pair of brush heads with flat sides, each carrying bristles, and disposed with the flat sides together, support means extending

through said heads to permit relative movement of said heads and the bristles carried thereby in the direction of the bristles, and a handle integral with one of said heads and shaped to comprise a continuation of both heads.

## Automatic Spraying Device

U. S. Pat. 2,328,448. E. Gustafsson and J. W. Baur, assignors to Binks Mfg. Co., Aug. 31, 1943. A spraying mechanism comprising a reciprocable carrier having a supporting member, a main supporting bar

angularly and linearly adjustable relative to said supporting member, means for securing said main supporting bar in adjusted position to said supporting member, a spray gun supporting bar angularly and linearly adjustable relative to said main supporting bar, means for securing said spray gun supporting bar in adjusted position to said main supporting bar, a spray gun angularly and linearly adjustable relative to said spray gun supporting bar, and means for securing said spray gun in adjusted position to said spray gun supporting bar.



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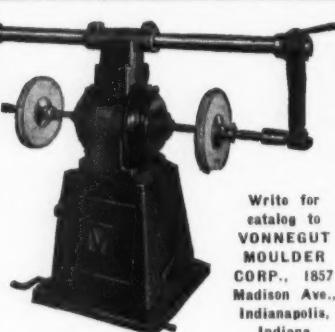
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### Coating Composition

U. S. Pat. 2,328,398. S. J. Roskosky, assignor to E. I. duPont de Nemours & Co., Aug. 31, 1943. A wire enamel comprising at least 25 per cent of a polyamide based on the non-volatile constituents of the enamel, said polyamide being the reaction product of a polymer-forming composition comprising reacting materials selected from at least one of the class consisting of polymerizable monoaminomonocarboxylic acids, and mixtures of diamine and dibasic carboxylic acids, the remainder being a mixture of an alkyd resin and a phenol-aldehyde resin, each of the latter two ingredients being present in substantial amount.

### Coating Composition

U. S. Pat. 2,329,663. R. C. Swain and P. Adams, assignors to American Cyanamid Co., Sept. 14, 1943. A coating composition containing substantial amounts of Manila resin and a melamineformaldehyde resin which has been alkylated with an alcohol containing at least 4 carbon atoms, wherein the molal ratio of formaldehyde to melamine is at least about 2.5:1 and when the weight ratio of Manila resin to melamine resin is between about 9:1 and 1:9.

### Coating Composition

U. S. Pat. 2,329,664. R. C. Swain and P. Adams, assignors to American Cyanamid Co., Sept. 14, 1943. A coating composition containing substantial amounts of kauri resin and a melamineformaldehyde resin which has been alkylated with an alcohol containing at least 4 carbon atoms, wherein the molal ratio of formaldehyde to melamine is at least about 2.5:1 and wherein the weight ratio of kauri resin to melamine resin is between about 9:1 and 1:9.

### Pigmented Coatings

U. S. Pat. 2,328,625. C. A. Doran and C. R. DeBow, Jr., assignors to E. I. duPont de Nemours & Co., Sept. 7, 1943. The process of preparing a grit- and gel-free pigmented nitrocellulose coating composition by selective filtration which comprises uniformly suspending therein from 0.1 to 0.5 per cent by weight of a diatomaceous filter aid having an inherent permeability coefficient of at least  $3.0 \times 10^{-5}$ , and thereafter filtering the said pigmented nitrocellulose coating composition under pressure.

### Coating Composition

U. S. Pat. 2,329,456. W. E. Campbell, Jr., assignor to Carbide and Carbon Chemicals Corp., Sept. 14, 1943. A coating composition of effective adhesion to smooth surfaces, containing a substantial amount of a conjoint polymer of a vinyl halide, a vinyl ester of a lower saturated fatty acid, and an aliphatic alpha, beta-mono-olefinic carboxylic acid, the amount of carboxylic acid combined in said polymer being between about 0.1% and about 4% by weight of the conjoint polymer and the carboxyl groups in said conjoint polymer being substantially unreacted.

# A Word

## TO THOSE WHO PICKLE



ACP Pickle Bath Toner is being utilized to improve the action of acid pickling and stripping baths in those cases where the use of Rodine is not indicated.

Pickle Bath Toner, supplied either as a liquid or powder, has little inhibiting effect and should, therefore, not be confused with the strong inhibitor, Rodine.

It, however, improves the effect of an uninhibited pickling or stripping bath. Among the improvements are:

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ACP Pickle Bath Toner can be used alone in acid baths or with Rodine, the action and effectiveness of which is thereby enhanced.

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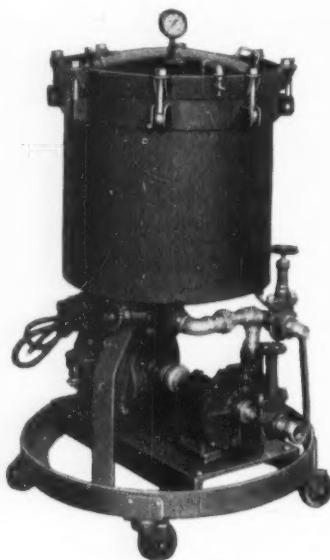
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## Post-war Finishes Described

NEW and improved finishes ranging from white paint, with pigment having one-third more hiding power, to rust-inhibitive priming coats over metal were forecast by Dr. D. H. Dawson, research supervisor of the Pigments Dept. of the *du Pont Co.*, Wilmington, Del., before the technical symposium of the Paint and Varnish Production Clubs. Further, Dr. Dawson predicted a decided post-war preference for brilliant colors, improvements in the new resin emulsion paints that are thinned with water, and low brightness infra-red reflectance paints for civilian use.

"Paint will be greatly improved as a result of wartime developments, although the need for new manufacturing equipment may delay these new finishes from becoming generally available immediately after the war", the Du Pont chemist said.

"Post-war paints will probably make those previously manufactured look dull. Recently, stronger organic pigments have been developed to take

the place of weaker inorganic colors. An immediate demand for bright colors was felt after the last war and this time the toning down has been much more general because of industrial camouflage and blackouts.

"Color will undoubtedly extend into fields where previously it was a minor factor. Railroad and ship lines were adopting attractive color schemes before the war. The expanding airplane industry may set a trend in decorative finishes to parallel that in the automotive field."

He described as a major wartime development the new high-hiding, chalk-resistant titanium dioxide white pigment in which the crystalline structure was altered to a denser arrangement of atoms in the molecule. This new so-called rutile type of titanium pigment is not only about one-third more opaque than previous white pigments but has superior resistance to chalking and fading.

The resin emulsion paints, "a most startling wartime development", will

doubtless undergo improvement by utilizing the more durable synthetic resins. Low brightness infra-red reflectance paints were also mentioned as war-perfected finishes of possible future value to the civilian.

"Zinc yellow pigment has witnessed phenomenal growth during the war period, due to its almost universal adoption for non-ferrous metal primers and its increasing use in ferrous metal primers, as in the Navy Bureau of Ships practice. The improvements which have been made in this pigment, its lower cost and wide availability, together with the expected large demand for metal priming paints, will doubtless lead to its widespread adoption.

"In view of the radical modifications represented by the new paint technology, it is not reasonable to expect these improvements to be available overnight when the war ends. New equipment will be required first of all. Manufacturing alterations involved in reformulation will require some time. But profound changes in paints for the civilian are certain."

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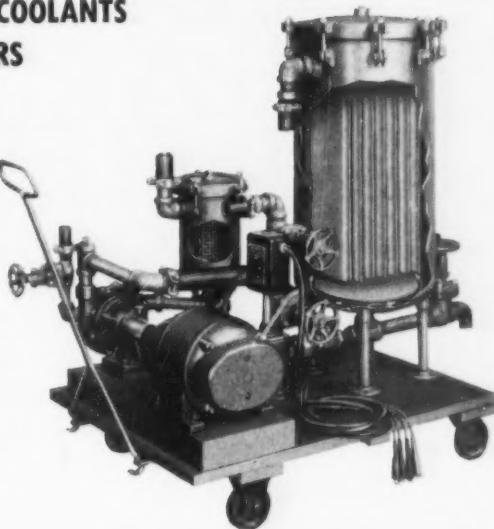
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## New Equipment

### Cleaner and Rust Inhibitor

Krome-Kote is a liquid metal cleaner for steel, aluminum, terne plate, galvanized steel, etc., containing phosphoric acid, solvents and other ingredients. It is recommended by the manufacturer for removing oil, grease, rust and oxide and is said to impart rust inhibiting properties to the metal treated and to create a firm base for all finishing materials on all metals.

This cleaner is supplied in concentrated form and is diluted with three parts of water before use. It may be applied hot or cold, by brushing or wiping.

Complete details including a sample or demonstration may be obtained from The Wolfe-Kote Co., Dept. OF, 705 Center Ave., Sheboygan, Wis.

### Colored Permanent Meter Charts

The Permochart Co., Dept. OF, Sewickley, Pa., has announced that Permocharts, plastic recording charts designed for continuous reuse, are now available in three colors: green, ivory and blue. Known as I-EZ Permocharts, these charts, like the white type, are made for all types of recording instruments using circular charts. They are non-flammable, entirely waterproof and resistant to oil, gasoline and grease. No meter changes or special pens or ink are required. At the end of each working period the ink record is removed from the chart surface by wiping with a damp cloth.

The colored I-EZ charts are said to reduce glare and eye strain to a minimum, thus making inspection easier, and to be especially useful for identifying different units or operations. When used as recommended, the colored and white charts are said by the manufacturer to be good for daily use over a period of two years under normal operating conditions.

### Paint Type Marker

Paintmarx, a paint type crayon for marking metals, is manufactured by The American Crayon Co., Dept. OF, 1706 Hayes Ave., Sandusky, O. This marker is recommended by the manufacturer for use on all metal surfaces where a permanent mark is desired. It is claimed that Paintmarx will not rub off accidentally, will retain its legibility in spite of weathering and can be used on any surface that will take paint. It is also claimed that the point of Paintmarx sticks does not become hard or crusty on exposure.

Complete information on these markers, available in black, white and four colors, and also a copy of the bulletin "American Industrial Crayon Guide" may be obtained by writing to the manufacturer.

### Stop-off Paint for Heat Treating

A stop-off paint for selective carburization on steel parts in liquid carburizing baths has been developed by the Park Chemical Co., Dept. OF, Detroit, Mich., and is now being marketed under the trade name "No-Kase." This new compound, the company states, provides positive protection from carburization on such difficult sections as threaded edges.

Applied as a paint, "No-Kase" is said to be easily confined to the area where protection is desired and to be sufficiently dry within an hour for immersion in the carburizing bath. The heat of the bath burns out the vehicle of the paint and leaves the pigment as a continuous metallic coating. Any of the coating remaining after carburizing and quenching is removed by wire brushing.

Patent applications have been filed covering the compound which is claimed to be the first successful stop-off paint yet developed for liquid carburizing and is a companion product to the company's "No-Carb" which serves an identical purpose in solid carburizers.

Both products were developed under the supervision of Mr. P. H. Kramer, Technical Director for Park Chemical Co., and both are now available through regular distributive channels.

### Viscosimeter

G-E Zahn viscosimeters for measuring the viscosity of organic finishing materials may be obtained from the General Electric Co., Dept. OF, 1 River Rd., Schenectady, N. Y.

Consisting of a bullet-shaped steel cup, the viscosimeter is suspended in the material to be measured by a 12-inch looped handle equipped with a ring at the end of the loop. When a reading is taken, the cup is lifted out of the liquid and a timer is started as it leaves the surface. The liquid flows through an orifice at the bottom of the cup and the timer is stopped when the stream flowing through the orifice breaks. The time of flow indicates the viscosity of the liquid.

This viscosimeter is said to give simple, quick and inexpensive viscosity measurements. Other advantages claimed are: no cleaning required since the instrument may be left in the material; no special skill required and readings may be made in labor-



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# PERMITE *Industrial* FINISHES

atory or factory in about 30 seconds.

G-E Zahn viscosimeters are available with orifice sizes suitable for use with materials ranging from solvents and thin mixtures to extremely heavy mixtures.

### Toluol Replacements

The Neville Co., Dept. OF, Pittsburgh 25, Pa., is the producer of Tollac and Nevsol, hydrocarbon solvents for use in the finishing industry.

Tollac, which is largely aromatic in character, is said to compare favorably with toluol and, based on its nitrocellulose tolerance, may be used in most cases as a direct alternate for this urgently needed war material. It is claimed to possess great strength and solvency and excellent evaporation qualities.

Nevsol has a nitrocellulose tolerance of approximately 80% of that of toluol. According to the manufacturer, it is preferred in many instances for its rapid evaporation and satisfactory strength and solvency at less cost.

Tollac and Nevsol are produced in accordance with specifications of U. S. Pat. No. 2,229,328. Both solvents are subject to W.P.B. allocation under M-137. Prices and complete specifications of these materials may be obtained on request.

### Paint Remover

O & R non-flammable paint remover may be obtained from O & R Sales Co., Dept. OF, 10-35 45th Ave., Long Island City 1, N. Y.

This paint remover is said to be harmless to the skin and entirely safe under ordinary ventilating conditions. It is claimed that it will not raise wood grain, roughen metal surfaces or injure fabrics or leather and, because it contains no wax, leaves no residue to be removed before refinishing.

Prices and complete information including copies of laboratory tests substantiating claims made for the material may be obtained from the company.

### Shellac Alternates

The Mac-Lac Co., Inc., Dept. OF, 127 Maiden Lane, New York 7, N. Y., is offering two shellac alternates, Smoothlac and Special-Lac, to the finishing industry.

Smoothlac is a combination of East India gum and modified resins with a viscosity of that of a five pound shellac. It may be reduced with any alcohol of good quality on the basis of four parts of material to one part of alcohol.

Special-Lac is a combination of natural gums and modified resins treated so as to make a perfect alternate for shellac as to appearance and masking qualities, according to the manufacturer. It may also be reduced four to one with alcohol.

Both Smoothlac and Special-Lac may be obtained in white and yellow. The former material is recommended for heavy service, the latter for finer work. Further details and prices will be sent on inquiry to the manufacturer.

### Mobilometer

The improved Fisher-Gardner Mobilometer for determining the mobility of paints, lacquers, and other finishing materials is offered by Eimer and Amend, Dept. OF, 635 Greenwich St., New York, N. Y. This instrument allows the determination of the mobility of a material by observing the time required for a standard disc to descend a fixed distance through the sample. By means of three interchangeable discs and a choice of weights for use on the plunger, has a wide range of application.

The improved model employs Monel metal in place of brass and has a new releasing

mechanism. It has a Monel metal water jacket which enables the laboratorian to control the temperature of the sample within close limits and thus insures more reproducible results. The water jacket, by providing means for raising the temperature of the sample, increases the range of the apparatus to fluid and semi-fluid greases as well as other viscous products.

The Fisher-Gardner Mobilometer is furnished complete with 4-hole, 51-hole and solid discs, spirit level, removable sample cylinder and water jacket. The Monel metal discs, cylinder, jacket and plunger are readily detached for cleaning.

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Enthone Enamel Strippers have no action on anodized aluminum, aluminum alloys, zinc or magnesium.

Their use means fast stripping of enamels without attacking the base metal.

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## Inert Gas Generators

Inert Gas Generators, built by Roots-Connerville Blower Corp., Dept. OF, Connerville, Ind., are discussed in Bulletin 100-B14 issued by the manufacturers. This is an eight-page booklet printed in two colors, with numerous illustrations.

The company's inert gas generators are built under the Harrison patent, issued Jan. 17, 1933, and are designed to produce a mixture of nitrogen and carbon dioxide with small percentage of water vapor and less than 1% of either oxygen or carbon monoxide, as desired. It is claimed to be a desirable means for furnishing inert gas at a low cost, as indicated by many varied applications.

While ordinarily thought of as a means of purging gas holders and other apparatus in connection with manufactured gas plants, this inert gas generator has also been found advantageous in industrial processes wherever flammable gases, or liquids with flammable characteristics, are treated, stored, or handled.

These generators, either gas or oil fired, are available in both portable and stationary types, for a capacity range of 1000 to 35000 CFH at a pressure of 3 lbs. When desired, high pressure installations can be supplied for special requirements and with storage facilities. Drive can be by electric motor, gas or steam engine, and the units are suitable for operation in outdoor locations.

## Manufacturers' Literature

### Pentalyn Resin Varnishes

A four-page booklet titled "Pentalyn Resin Varnishes, Their Suitability for Maritime Finishes" has been released by Hercules Powder Co., Synthetics Dep't, OF, Wilmington, Del.

This booklet describes an investigation undertaken on the use of Pentalyn resins in varnishes to meet specifications of the Maritime Commission. An analysis of the requirements of such finishes and data derived to date are given. The preparation and test results of Pentalyn varnishes against Specification No. 52-MC-7 for water resisting spar varnish and Specification No. 52-MC-14 for furniture rubbing varnish are given in some detail. A table of the properties and uses of the various Pentalyn resins is included in the booklet.

### Control of Hot-Blast Temperatures

The Brown Instrument Co., Dept. OF, Wayne & Roberts Aves., Philadelphia, has issued a new bulletin entitled "Brown Control System for Hot Blast Temperatures." This bulletin is a supplement to Bulletin 27-7 which treated on the control of hot blast temperatures with a single mixing valve.

The new bulletin, BF-1, was issued to cover the newer furnaces and those being modernized, which are equipped with a cold blast valve common to all stoves. For these furnaces a control system has been developed that automatically regulates the mixing valve and/or the cold blast valve to maintain a constant predetermined hot blast temperature.

The bulletin describes the principle of operation of this control system in detail and the advantages obtained by its use and is supplemented by a detailed installation diagram and description of the recommended instruments and equipment.

### Drier Booklet and Slide Rule

Harshaw Chemical Co., Dept. OF, 1945 E. 97th St., Cleveland 6, O., has announced a new 16-page booklet on its line of driers for the paint, varnish and ink industries. The booklet contains facts on metal contents of driers, specific gravities, bulking values, metal ratios, indicated uses and other data compiled from the company's laboratory and research records. A three-page price list accompanies the booklet.

Announcement also has been made by the company of a new time saving slide rule by means of which the number of pounds of drier of a given metal content may be obtained for a desired metal ratio in a given batch of material. The slide rule may also be used to convert gallons to pounds.

Copies of the booklet and price list and the slide rule may be obtained on request to the company.



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Manufacturers of Electroplating, Buffing, Polishing Apparatus and Supplies.

202-208 Emmet St. Newark, N. J.  
Branch Offices: New York, Philadelphia, Woonsocket, R. I.

## Copper Stripping Problems??

Solve it

by

McKEON'S

**Liquid Sulphur**  
TRADE MARK REGD.

SULPHUR PRODUCTS CO.  
GREENSBURG, PA.

## SPEED PRODUCTION—CONSERVE CRITICAL METAL



AMERICAN NICKELOID COMPANY -

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## FOR HARD CHROMIUM USE ZIALITE ADDITION AGENTS

to obtain

1. Finer grain structure
2. More durable plate
3. Smoother heavy plate
4. Greater throwing power
5. Less sensitivity to sulphate ratio.

Send a sample of your present bath to see if it is suitable for conversion to this improved formula.

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143 Exchange Street  
Worcester, Mass.



A new type, long wearing, economical abrasive grain. Perfected and introduced by us as a substitute for imported Turkish Emery. Leading defense plants now using large quantities for essential war-work, report excellent results.

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10 to 60 Volts

2—3200 Ampere Westinghouse  
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3—1600 Ampere Westinghouse  
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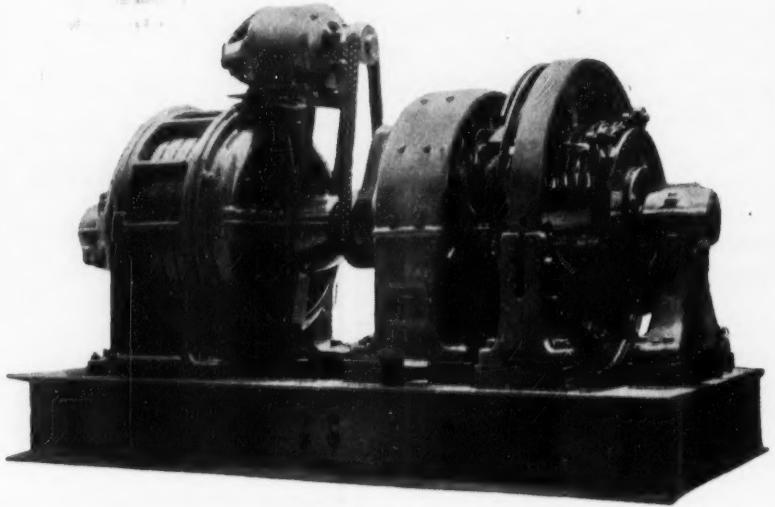
3—800 Ampere Westinghouse  
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separate excited, driven by 3 phase, 60 cycle 220/440 Volt A.C. Motor.

New York City's Largest Stock Electrical Equipment

**L. J. LAND & CO.**

150 GRAND ST.

CAnal 6-6976

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Available for prompt shipment in ratings from 100 to 2000  
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- 90 amp. 8 volt 1750 RPM Continental ball bearing.
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### Plating Dynamos and Motor Generator Sets

All Sizes Carried in Stock  
Tumbling and Plating Barrels and most anything for  
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Largest Stock of Rebuilt  
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Let us have your require-  
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parts thereof bought for  
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274 South 9th Street, at Broadway, Brooklyn, N. Y.  
EVergreen 7-3314—3315—3316

*"If it's metal finishing equipment or supplies—we have it."*

## PLATING EQUIPMENT & SUPPLY CO.

### Plating Dynamos

### Motor Generator Sets

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Plating Tanks	Ammeters	Filters
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Spraying Systems	Voltmeters	Blower Systems

2—5000 amperes, 8/16 volts, Bogue motor generator  
sets, perfect condition and

2—Acme Ball bearing aerial swing frame grinders.

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### (AVAILABLE FOR IMMEDIATE SHIPMENT)

- 3—5000/2500 AMPERE, 6/12 VOLT, A. P. MUNNING "OPTIMUS" Motor Generator Sets. Full Panel-Board Arrangement. Excellent Condition.
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- 1—1000/500 AMPERE, 6/12 VOLT, HANSON & VAN WINKLE CO. Motor Generator Set. Interpole Design. Excellent Condition.
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- 1—900/450 AMPERE, 10/20 VOLT BENNETT & O'CONNELL ELECTRIC CO. Motor Generator Set. Excellent Condition.
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- 1—LA SALCO, INC. SINGLE NO. 1 SIZE BALL BURNISHING BARREL. Motor Drive. New. No Priority Required.
- 2—U. S. ELECTRIC TOOL CO. MOTOR-IN-HEAD HEAVY DUTY BUFFING LATHES, 10 HP, 220 VOLT, 3 PHASE, 60 CYCLES, 1800 RPM.

#### MANY OTHER SIZES IN STOCK

BAIRD & ABBOTT—Burnishing and Tumbling Barrels. Polishing Lathes, Rheostats, Ammeters, Blowers, Tanks, Polishing Wheels and many other items for the Plating and Polishing Department.

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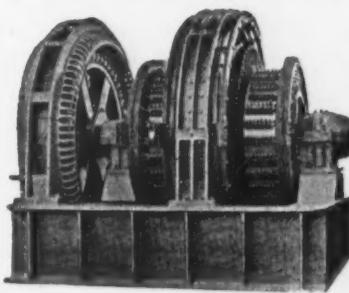
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Prompt available shipment from stock.

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114 Post Road, Fairfield, Connecticut

## REBUILT AND GUARANTEED Polishing and Plating Equipment



Largest and most complete stock of plating generator sets in America, too numerous to list, 100 amperes to 7500 amperes, 6/12 volts. Rheostats, Tumbling, Burnishing and Mechanical Plating Barrels.

**Polishing & Buffing Lathes—Belt Drive, Motor Drive and Multi "V" Belt Drive.**

**Blowers, all sizes, belt and motor driven.**

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Whatever your requirements may be in the plating and polishing line—call us for prices before placing your order.

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## CLINTON SUPPLY CO.

112 So. Clinton Street

Chicago, Illinois

Phone, Franklin 3538-3539



## FOR SALE

1—50 H.P. Crocker Wheeler A.C. Motor, type SC, 220 Volt, 3 phase, 60 cycle, 850 R.P.M., complete with starter.

1—Rebuilt Motor Generator Set, 1500 Amperes, 6 Volts, complete.

#### BEAM-KNODEL COMPANY

195 Lafayette St., N. Y. City

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**For Results  
Advertise In Metal Finishing**

**WANTED—24 volt plating generator, 1000 to 1500 amp. Apply Box 240, Chicopee, Massachusetts.**

## SITUATIONS OPEN

**SITUATION OPEN** — Man with chemical and technical knowledge electroplating processes for inside and outside sales promotion and product development. Our equipment essential in every electroplating plant. Give details regarding experience, age, salary, marital and draft status. Permanent position for qualified man. Plant located Chicago, Illinois. Address Box Dec. 2, care Metal Finishing, 11 West 42nd Street, New York City 18, New York.

**WANTED**—by old established company—Technical Sales Service Men for servicing metal cleaning and wire drawing chemicals to war plants in the metal processing industries, chemical or technical background helpful. Good salary while training with drawing account and liberal commission plan when assigned a territory. Excellent postwar prospects. Address Box No. Dec. 3, care of Metal Finishing, 11 West 42nd St., New York 18, N. Y.

### PLATER

**SITUATION OPEN**—Man capable of taking charge of plating department in job shop, on war work, one that understands solutions, finishes, also hard chrome plating, must be capable of producing. Reply Dec. 1, care Metal Finishing, 11 W. 42nd Street, New York 18, N. Y.

### PLATER

**SITUATION OPEN**—Experienced barrel and still tank plating for modest plant, New York City. Permanent position for qualified man. Reply, giving all pertinent information. Box N2, Metal Finishing, 11 West 42nd Street, New York 18, N. Y.

## SITUATIONS WANTED

### PLATING EXECUTIVES

**SITUATIONS WANTED**—In response to our ad in the October issue, we have received several applications from plating executives who are seeking positions. If you have an opening, please address: Metal Finishing, 11 West 42nd Street, New York 18, N. Y.

### FOREMAN POLISHER

**SITUATION WANTED**—By polisher who has had several years of executive experience. Address Box Oct. 2, care Metal Finishing, 11 W. 42nd Street, New York 18, N. Y.

### INDUSTRIAL CLEANERS

**SITUATION WANTED**—Technical Executive—thoroughly experienced formulations—service—sales—All types of cleaners for all kinds of industries. Exceptionally versed in problems of the metal industry. Address Box Oct. 1, care Metal Finishing, 11 W. 42nd Street, New York 18, N. Y.

### ELECTRO-CHEMICAL ENGINEER

Many years experience in the field of hard-chromium plating of machine-parts, cutting-tools, etc., is desirous of a connection with a progressive firm in the New England area as a technical consultant. Address: Electro-chemical Engineer, care Metal Finishing, 11 West 42nd St., New York, N. Y.

### SALESMAN

**SITUATION WANTED**—Salesman who has had over twenty years in sales and service, contacting every type of manufacture. Well versed in metal plating finishing. Can accept a position immediately. Address H. J., care Metal Finishing, 11 West 42nd St., New York.

### REPRESENTATIVE

**SITUATION WANTED**—Inquiries solicited from firms selling metal finishing products and equipment seeking service and selling representation in Connecticut or New England. Have thorough technical background and practical experience in metal finishing processes. Address C C., care Metal Finishing, 11 W. 42nd Street, New York 18, N. Y.

### SUPERVISOR

**SITUATION WANTED**—Supervisor seeks situation; 22 years practical and technical experience in all phases of Electroplating and Metal Finishing; specification and production specialist; at present not employed to his ability; seeks change to capacity of ability. Address Nov. 10, care Metal Finishing, 11 W. 42nd Street, New York 18, N. Y.

### FOREMAN POLISHER

**SITUATION WANTED**—Industrious metal polisher foreman with wide experience in lighting fixtures, floor lamp, hardware and plumbing supplies; also several years' experience in jobbing shops on all metals. Has taken charge for over 14 years as foreman and production superintendent for a large concern. Will travel anywhere. Seeking a permanent position. Age 41, 23 years experience. Address Foreman Polisher, care of Metal Finishing.

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## LUPOMATIC AGAIN IN THE FRONT LINE!



Introducing an entirely new product, DEBURRMASTER equipment for large scale production in deburring small and large parts.

We will gladly demonstrate on your own parts the merits of the Lupomatic Deburring Equipment. Send parts for test and request for full information today.

**LUPOMATIC TUMBLING MACHINE CO., INC.**

4510 BULLARD AVE.  
NEW YORK, N. Y.

THE NEW  
GLOBE  
DESIGNED  
*Burr-*  
*Master*

SPEEDS DIFFICULT  
DEBURRING OPERATIONS  
ON HARDENED METAL PARTS

● The new Burr-Master Tumbling Barrels were originated by Globe to provide a more rapid means of cleaning and deburring today's tougher metal parts. The Burr-Master comes in two sizes. The Standard (top illustration) and the Senior (below). The Standard is equipped with a low speed, gearhead motor and is the tilting type for easy loading and unloading. The Senior is a double compartment, horizontal type with water-tight shells. The Senior is recommended where large quantities of parts are to be deburred. Write for new Burr-Master literature today.



## ODDS and ENDS

### People and Things:

Rubber was given its name in 1770 by Joseph Priestley, the discoverer of oxygen. He called it rubber because it would erase lead pencil marks, which was probably considered poor logic by his contemporaries. And, Dr. Isaac Adams, who first commercialized nickel plating, was educated at Harvard for the medical profession. He was disinherited by his father for his interest in nickel plating.

Al Puopolo, who runs the analytical department, informs us that he can always tell when a client is having plating troubles and requires an analysis in a hurry—the sample of plating solution arrives in a *Bromo-Seltzer* bottle.

The news of a new iron electrotyping bath reminds us that we found out why an electrotyping plant is called a *foundry* the first time we walked into one wearing our light gray slacks. How does one get graphite out of clothes??

### Thought of the Month:

"Nothing is really work unless you would rather be doing something else."—Sir James M. Barrie.

### News From Washington:

O.W.I. release: "Lead plating is prohibited for any decorative purpose." Our carefully considered opinion is that this is one ruling which will never be disregarded by industry.

We were stopped short last month by an announcement in the first sentence of a W.P.B. Salvage Division release, that scrap shipments out of graveyards in August amounted to 86,882 tons. Our first thoughts were of the meat shortage but we recovered our composure six lines further down, where we learned that *auto graveyards* were meant.

### Definition of the Month:

An optimist is a guy who orders materials using a priority of A-10.

### Slips that Pass:

From a recent issue of a well-known paper: ". . . are made of beryllium, a copper alloy. . . ." And all this time the scientific world has been under the impression that beryllium is an element.

We read all the news about the coal situation, mainly to see whether the reporters know that the word *anthracite* is a noun, meaning hard coal, and not an adjective. Most of them add the redundant word coal to anthracite, which is like saying *hard coal coal*. This gives us a feeling of superiority, which generally lasts until some sharp-eyed subscriber points out our own errors—like the upside-down photo in the last issue of *Metal Finishing*. Of course, we blame such things on the war situation, but we are already worrying about what we will use as an excuse after the war is won. Even editors have post-war problems.

All of which reminds us of the story about the newspaper editor who had cause to scold his son on account of his reluctance to attend school.

"You must go regularly and learn to be a great scholar", said the fond father encouragingly, "otherwise you can never be an editor, you know. What would you do, for instance, if your paper came out full of mistakes?"

"Father", was the reply, "I'd blame them on the printer".

And then the father fell on his son's neck and wept for joy. He knew he had a worthy successor for the editorial chair.

The best one we've seen in print lately, however, is *residual residue*, which slipped by the proofreader(?) of a magazine we will leave unnamed, as usual. Perhaps one of our readers will let us know what such a residue looks like so that we will recognize it the next time we run across one. Or is it that which remains behind when that which remains behind is removed from that which remains behind?? In other words, the residue of a residue.

### Slogan of the Month:

Don't Put Your Trust in Money—Put Your Money in Trust. BUY WAR BONDS and we hope you all enjoy a Merry Christmas and a Happy New Year.

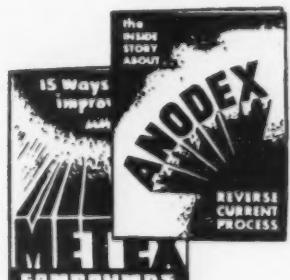
**READY  
NOW  
FOR POST WAR  
CLEANING**



During the past few years MAC DERMID Incorporated chemists and service engineers have developed over fifty various formulations of standard MAC DERMID Incorporated compounds for faster, more positive cleaning of metals. Many of these are merely specialized variations of METEX, ANODEX and METALEX compounds that have long been recognized as leaders in their fields . . . others have been developed for particular cleaning needs from the smallest pickling operation to the most complex cleaning problem.

*Let Us Help You With Your  
Post War Planning*

We'll be pleased to help you determine the fastest and most satisfactory way to clean your products by having one of our regional service engineers call at your convenience. He'll show you how to use the newer, faster acting compounds for cleaning your present and post war products. Don't hesitate to write for any help that we can offer, get our new Data Sheets and folders—our organization has been established on friendly, interested service to the industry!



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INCORPORATED  
**WATERBURY 88, CONNECTICUT**

**WRITE ONE OF THESE SERVICE ORGANIZATIONS FOR FREE DEMONSTRATION**

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Nobs Chemical Co.

**CLEVELAND**  
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McGear Chem. Co.

**ST. LOUIS**  
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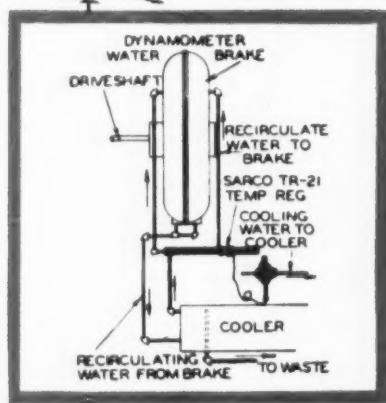
**TORONTO—CAN.**  
Clark Industrial  
Supplies Co.



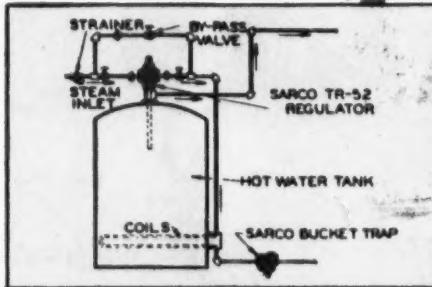
# "Of course it can be done"

M.H.P.

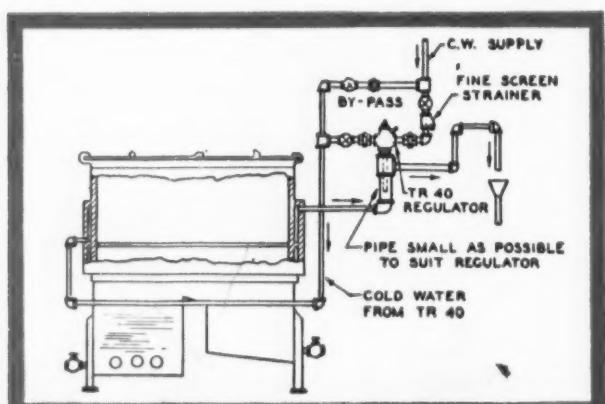
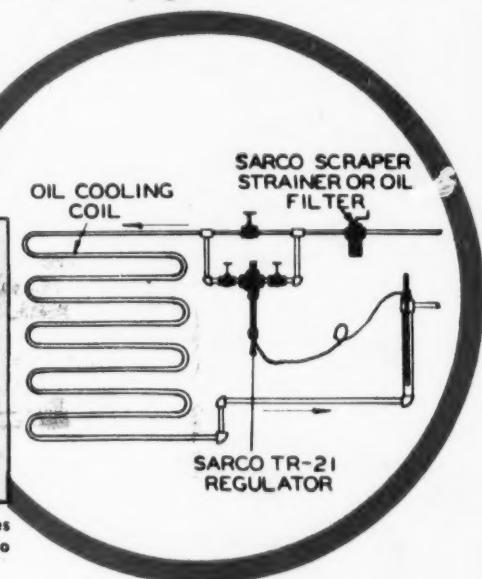
Every year more equipment manufacturers incorporate Sarco steam traps and temperature control as a part of their original equipment, and Sarco strainers are used by the thousands for pipe line protection. It's good business—good insurance for the satisfactory operation of the product. A few of the applications are shown on this page.



Dynamometer test sets held within 1½ degrees with Sarco Temperature Control.



Hundreds of water heaters on mobile laundries are equipped by the manufacturer with Sarco TR-52 regulators.

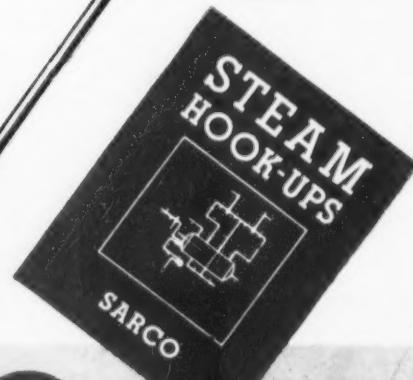


MAY - 1 1945

TR-50  
Temperature  
Regulator



Manufacturer of metal washing machines standardizes on Sarco TR-50 control.



The Sarco Hook-up Book gives many suggestions for product design engineers.

## Ask Sarco First

Many of the unusual Sarco applications have been instigated by customer requests. Give us a chance to say "It can be done."

SARCO COMPANY, INC.  
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